Pythagoras
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An online and open access Pre-Calculus Course (MOOC)

English

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https://www.pythagoras-grant.eu/

1. Introduction in STACK

Moodle STACK (System for Teaching and Assessment using a Computer algebra Kernel) is a sophisticated assessment system designed for mathematics, scientific, and related disciplines, integrated into the Moodle online learning platform. This complex solution provides an interactive and flexible environment for testing and evaluating student knowledge in mathematics and sciences, enabling responses that involve mathematical expressions, thereby replacing multiple-choice questions with the ability to input mathematical solutions directly.

DataRoom implementation to create the physical and software platform

- A space has been created for the installation of the DataRoom.
- Electrical and internet connections with backup were ensured.
- A specialized application server was purchased.
- A domain was purchased for the current and future applications.
- A server virtualization system has been configured.
- The specialized STACK environment has been installed.
- The suites of specialized packages for advanced e-learning services have been installed.
- System user hierarchies have been created.
- System maintenance and updates are continuously ensured.

How we work on DataRoom side

- OS configuration for application server.

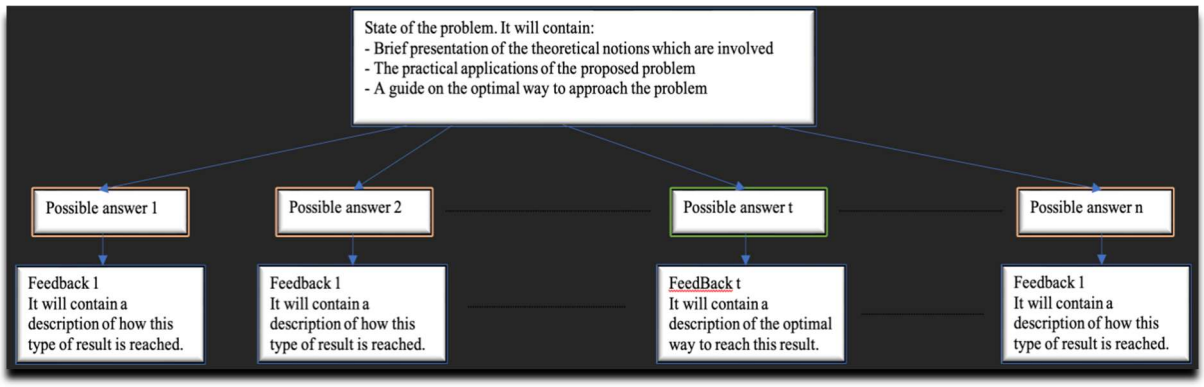
- Configuration of virtualization system for the server.
- Configuring virtual servers.
- Configuring the virtual machine for the moodle environment.
- Configuration of packages for the implemented services (including stack/moodle environment).
- Maintenance of virtual machines, physical server, website.

Formative Feedback in Digital Assessments

Background: Continuous assignments have become increasingly common due to the rapid development of digital solutions, such as computer-aided assessment systems that provide direct feedback to students; however, a major drawback of these systems is their emphasis on procedural tasks, which are easier to autocorrect, often resulting in feedback that merely indicates whether an answer is right or wrong without offering formative guidance—yet, research highlights that for feedback to be truly effective in supporting student learning, it must include additional explanatory information.

Method: The goal is to develop principles for designing digital learning environments through exploratory activities with customized, automatically generated *formative feedback* by integrating a computer-aided assessment system (STACK) with dynamic mathematics software (GeoGebra). Constructing formative feedback for cases where a student gives incorrect answers, for each subclass of incorrect answers - explaining the concepts necessary for the student to understand why he was wrong, where he was wrong in order to be able to answer a subclass of problems correctly.
Constructing formative feedback in case the student chooses a correct answer - the student will be presented with alternative methods by which he could solve the problem, thus expanding his area of knowledge in the field.

Structure of a problem with formative feedback:



In various systems, due to the implementation difficulties, math questions often ***have to be multiple choice questions***. However, with the STACK question type, the students are offered more possibilities: they ***can use visual or other type of formative feedback when solving the task and enter directly math answers,*** not only choose among answers.

STACK questions can have several parts and each part can be ***assessed separately***.

STACK questions can also include ***randomly generated*** components, which makes it much easier to create a series of practical questions and also prevent students from collaborating during a test.

Student responses can be assessed on the basis of a series of tests, with ***feedback,*** and different grades returned to students based on test results.

- For example, STACK offers the possibility to introduce at the beginning of the evaluation a theoretical part that will give the student a short recapitulation that will help in obtaining a maximum score.

Information

Definition: A sequence of real numbers is a function $f:\mathbb{N}\to\mathbb{R}$, $f(n)=a_n$ or $f:\mathbb{N}\setminus A\to\mathbb{R}$, where $A\subset\mathbb{N}$ finite, $f(n)=a_n$.

Notation: (a_n) is the sequence defined by the function f.

Definition: A sequence of real numbers (a_n) is increasing (decreasing) if $a_n\leq a_{n+1}$ $(a_n\geq a_{n+1})$, $\forall n\geq 0$. If the above inequalities are strictly, then the sequence is called strictly increasing (strictly decreasing).

To study the monotony of a sequence (a_n), the sign of the difference $\Delta a_n=a_{n+1}-a_n$ can be establish or to compare the ratio $\frac{a_{n+1}}{a_n}$ with 1, when $a_n>0, \forall n\geq 0$.

Types of questions

In the stack there are several types of questions that can be implemented:

- *Multiple choice* – allows the selection of a singular o multiple responses from a pre-defined list
- *True/False* – a simple form of multiple choice question with just the two choices “True” and ”Fals”
- *Matching* – the answer to each of a number of subquestion must be selected from a list of possibilities
- *Essay* – allows a response of a file upload and/or online text. This must then be graded manually
- *Drag and drop into text* – STACK provides mathematical questions for the Moodle quiz. These use a computer algebra system to establish the mathematical properties of the student's responses.
- *Select missing words* – missing words in the question text are filled in using drop-down menus
- *STACK* - STACK provides mathematical questions for the Moodle quiz. These use a computer algebra system to establish the mathematical properties of the student's responses.

Steps taken in implementing the question:

➢we must enter a name for the question

Question name: workshop_example

➢for an easy use and management of the code in the stack, we have the possibility to define variables and assign them values, like this; if we have a complex answer for the question or we have a frequently used expression within the statement, we can define variables by assigning them those values:

Question variables

```
ta1: {-2*n^3+5*n+1}/{n^2-4};
ta2: {-2*n^2+5*n+1}/{n^3-27};
ta3: {6*n^3+5*n+1}/{10*n^3-1};
```

➢introduce the statement:

Question text

Let \((s_n)=\left\{\frac{P_k(n)}{Q_i(n)}, n\in\mathbb{N}\right\}\) a sequence such that \(P_k(n)\) and \(Q_i(n)\) are two polinomyal of degrees \(k\leq 3\) respectively.
Give an example of a sequence \(s_n\) such that sequence is

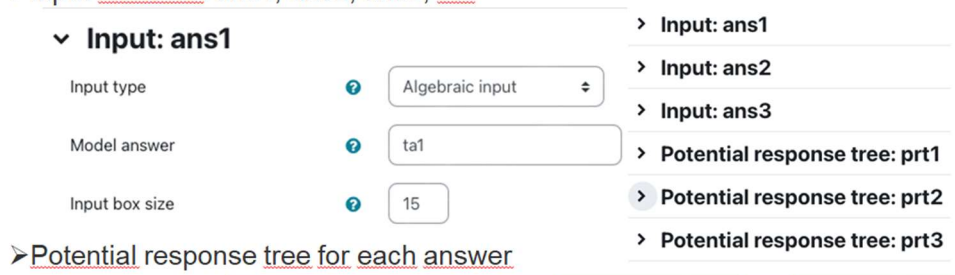
a) divergent;[[input:ans1]] [[validation:ans1]][[feedback:prt1]]

b) convergent to zero;[[input:ans2]] [[validation:ans2]][[feedback:prt2]]

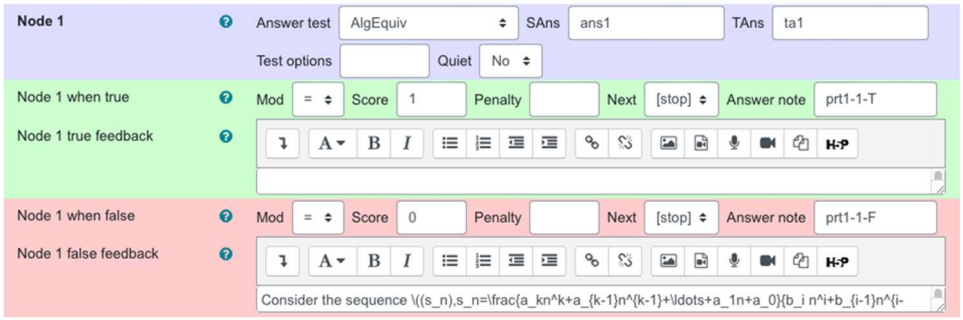
c) convergent to \(\frac{3}{5}\).[[input:ans3]] [[validation:ans3]][[feedback:prt3]]

- mathematical equations are inserted between \(\)
- for each sub-point in the question we will have one answer, which will have to be validated with the answer given by the teacher, and we can have specific feedback for each sub-point, whether the answer is correct, partially correct or incorrect

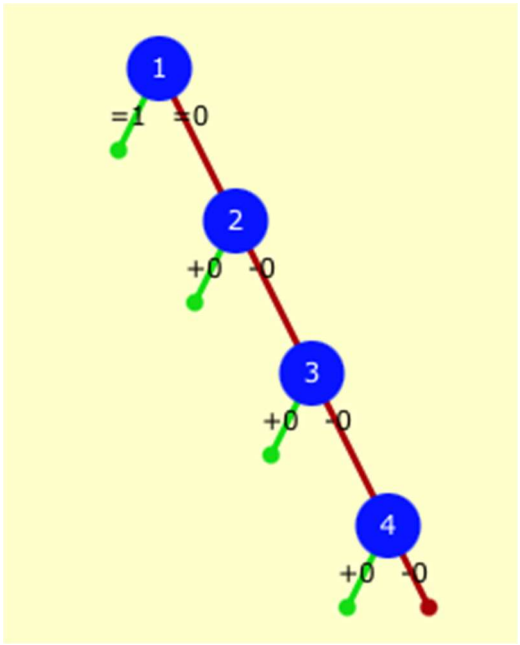
➢Input answers: ans1, ans2, ans3, etc



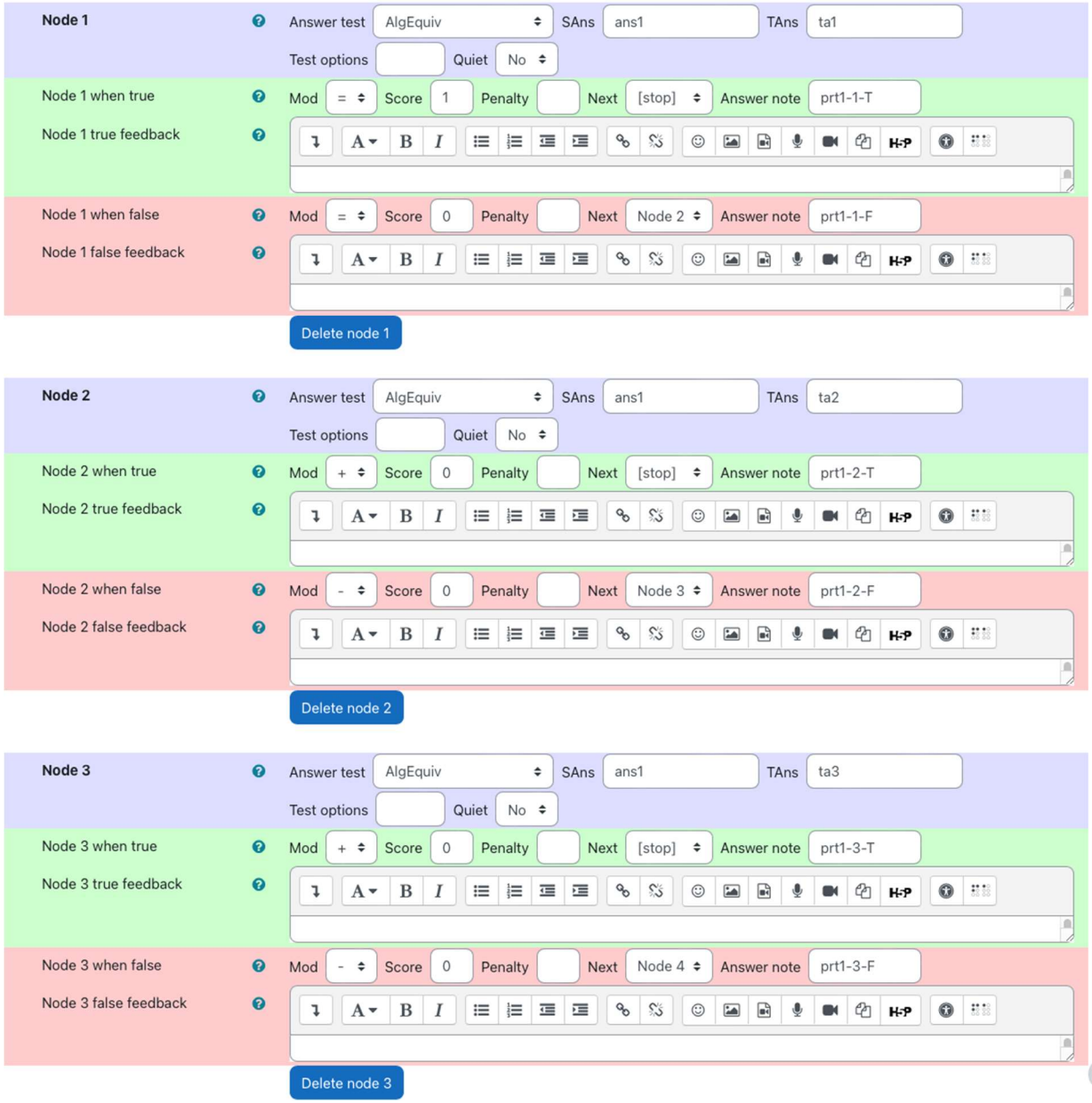
➢Potential response tree for each answer



- Since the question has several forms of correct answer, the tree related to the answers must be implemented



- implementing the tree related to the correct answers



Examples for different types of equations in STACK

- possibility to access GeoGebra to calculate the correct answer

Give an example of a sequence:

$(s_n)=\frac{an+b}{cn+d}, n \in \mathbb{N}$, where $a, b, c, d \in \mathbb{R}$ such that the sequence is:

a) increasing and convergent to 3;

b) decreasing and convergent to 3.

Use GeoGebra to check your sequences before you answer.

https://www.geogebra.org/calculator

Select the correct answer:

a. sequence (s_n) is decreasing to 3 if $a = 3c, ad \leq bc$

b. sequence (s_n) is increasing to 3 if $a = 3c, ad \geq bc, \frac{d}{c} \geq 0$ ✔

c. sequence (s_n) is decreasing to 3 if $a = 3c, ad \leq bc, \frac{d}{c} \geq 0$

d. sequence (s_n) is increasing to 3 if $a = 3c, ad \geq bc$ ✖

- combined feedback

For any correct response

Your answer is correct.

Consider the sequence \((s_n),s_n=\frac{an+b}{cn+d}\).

\((s_n)\) is increasing if \(ad\geq bc, \frac{d}{c} \geq 0\)

For any partially correct response

Your answer is partially correct.

Theory: A sequence (\(s_n\)) is increasing (decreasing) if \(s_{n+1}\geq s_n\), \(\forall n \in\) \(\mathbb{N}\), (\(s_{n+1}\leq s_n\), \(\forall n\in\)\(\mathbb{N}\)).

Options

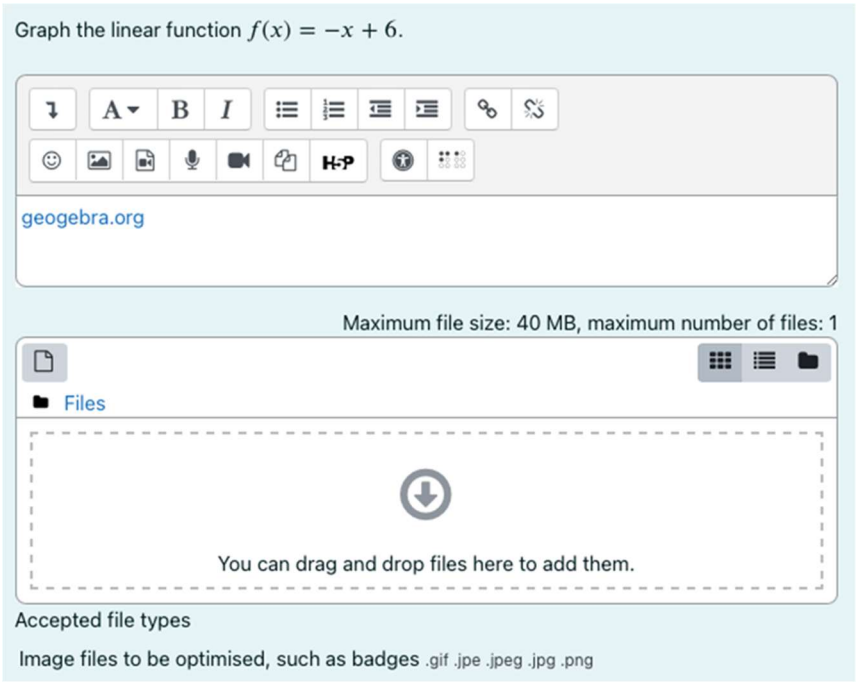
Show the number of correct responses once the question has finished

For any incorrect response

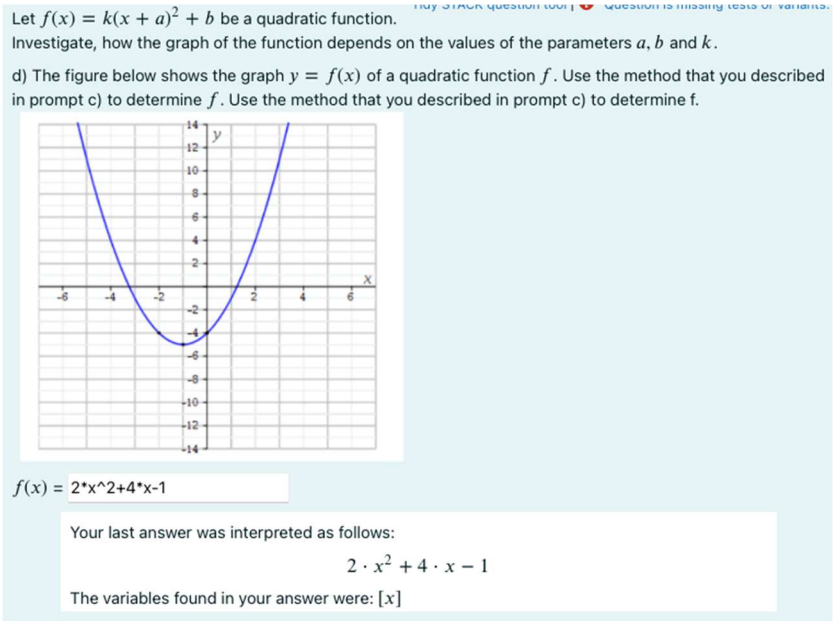
Your answer is incorrect.

Theory: A sequence (\(s_n\)) is increasing (decreasing) if \(s_{n+1}\geq s_n\), \(\forall n \in\) \(\mathbb{N}\), (\(s_{n+1}\leq s_n\), \(\forall n\in\)\(\mathbb{N}\)).

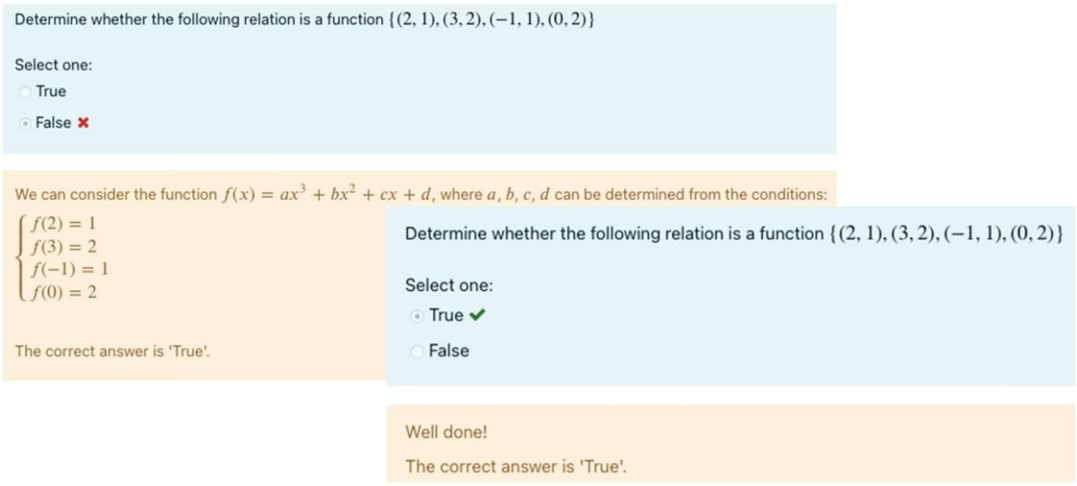
- upload the file containing the graph generated in GeoGebra



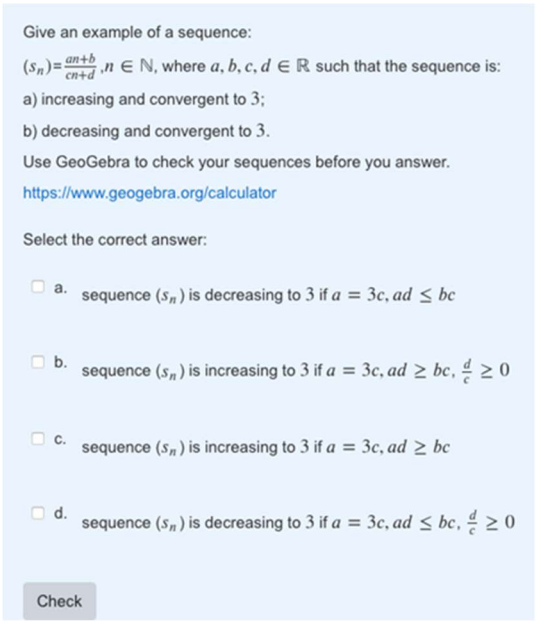
- inserting the equation that describes the graph in the problem statement



- a simple form of multiple choice question with just the two choices “True” and ”Fals”

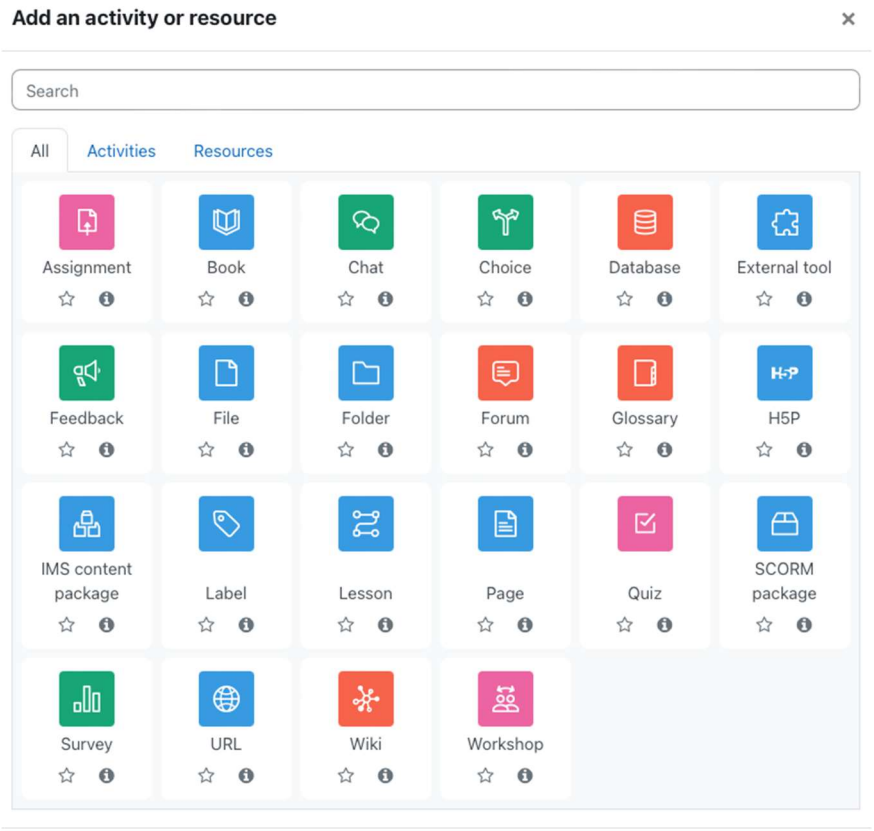


- multiple choice question



Creates, configure the test and assigning it to students

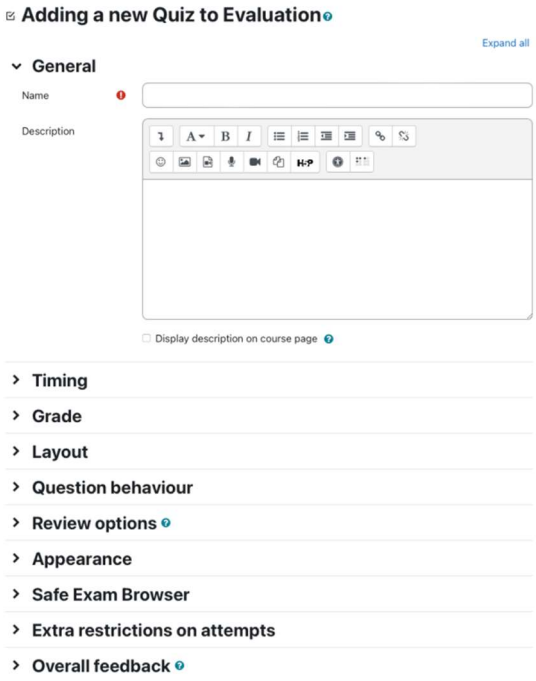
- Identify the section where you want to enter the test (for example, the current week) and add a new activity (Add an activity or resource) of the grid test type (Quiz)



- Complete the requested data about the new created test:

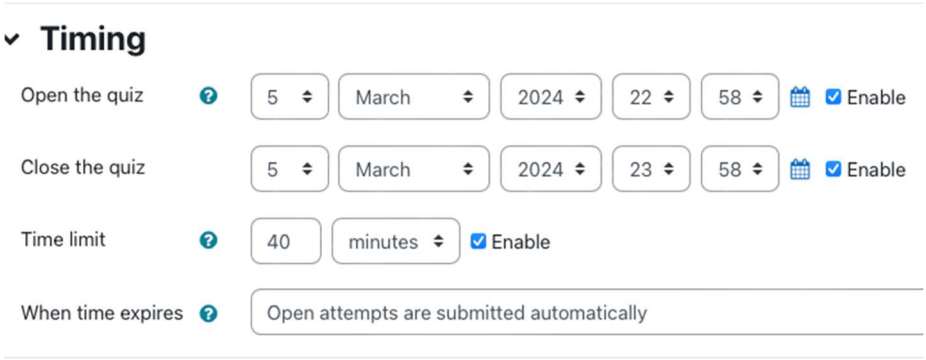
In the General section:

- The name of the test (Name), a field that will also appear on the main page of the discipline;
- Description of the test (Description), a field that can appear on the main page of the discipline if you check the appropriate box below the description;

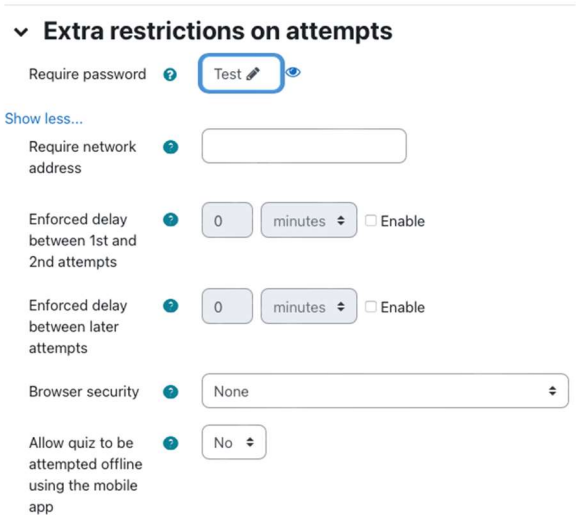


- In the Timing section:
  - Date and time when the test becomes available to students (Open the quiz);
  - Date and time when the test becomes unavailable to students (Close the quiz).

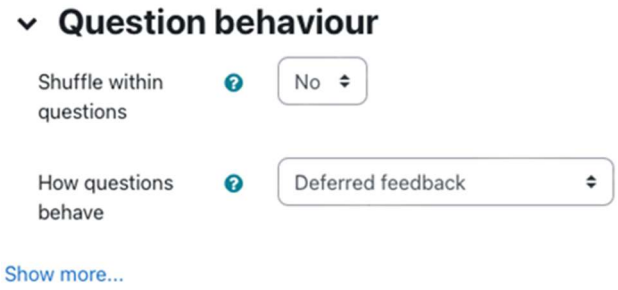
  Attention: if students are still working at that time, the test will be closed automatically;



- In the Extra restrictions on attempts section: From this section you can configure a password for accessing the test (to set it, press the Pencil icon);

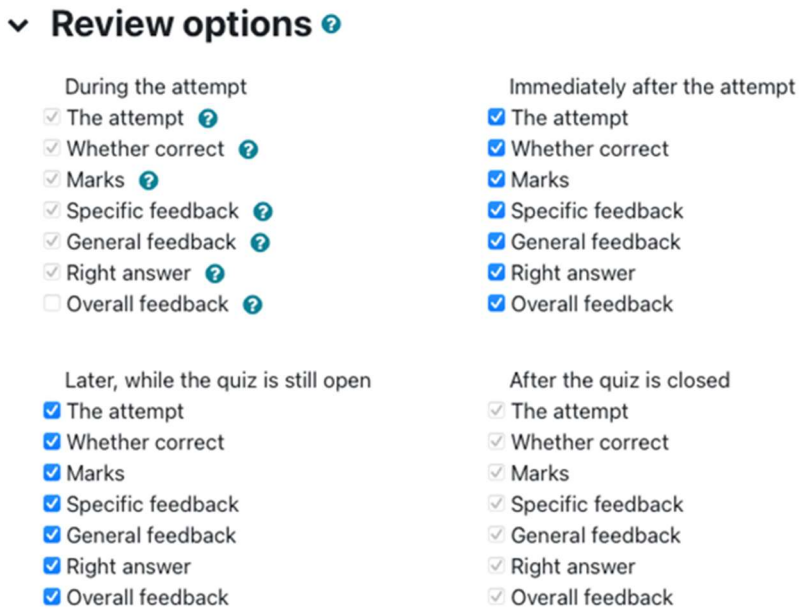


- In the Question behaviour section: choose for mixing answers within a question (Yes) or for keeping the order of the answers within the questions (No). We recommend mixing the answers like this make it harder for students to communicate their answers to questions.

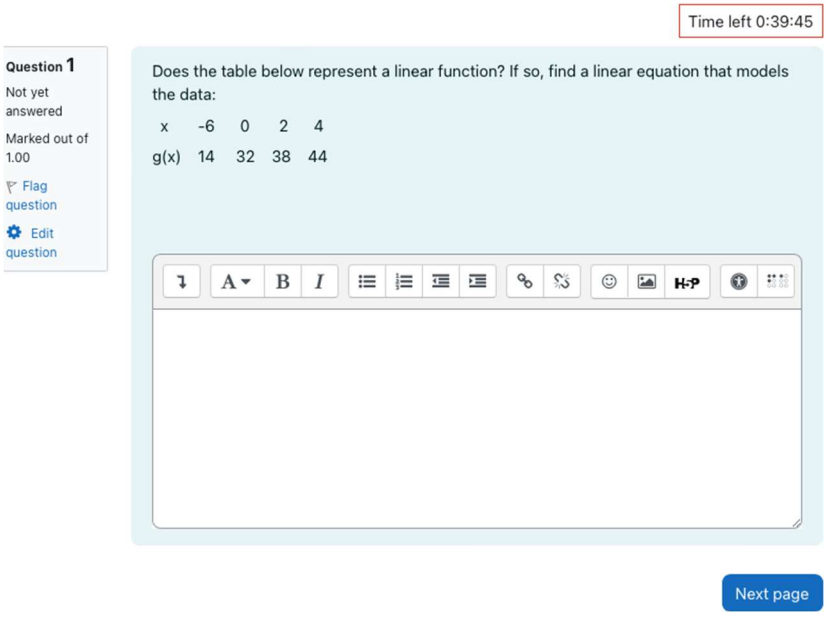


- In the Review Options section: we recommend unchecking “The attempt box” in the last two columns (Later, while the quiz is still open, respectively after the quiz is closed) to prevent students from viewing the grid quiz (the questions and correct answers) after they have completed the assessment. Students will only be able to

view this information immediately after the assessment is complete (approximately 5 minutes). Students will also be able to view their grade at any point in time after completing the assessment.

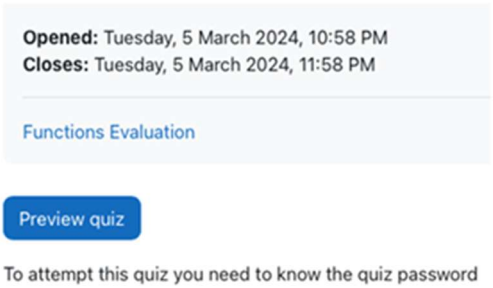


- The remaining time for solving the problems will be displayed on the page of each question, so that at any moment the student will be able to see how much time he has until the end of the test.



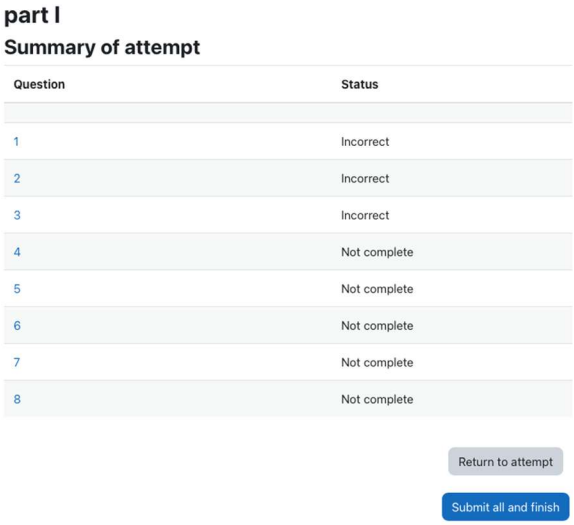
- Save the changes and enter the stage of adding questions to the test. After you have created the test, it is time to assign it to the students enrolled in the course.

The student will know from the beginning between which dates and times he will be able to solve the test and how much time he has available from the moment the test starts until its completion, if you have set this part.

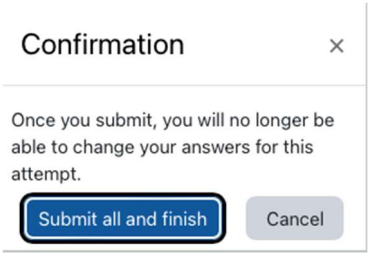


- To complete the test, the student will press Finish attempt..., placed in the lower right area of the page.

A summary of the answers is presented before the test is completed; At this point, the student can see the questions he has not answered yet, as well as how much time he has left.



If he wants to complete, he will press Submit all and finish, followed by a confirmation from him.



Guide for entering the answer

- for $\begin{bmatrix} 1 & 3 \\ 5 & 9 \end{bmatrix}$ should be entered as $matrix([1,3],[5,9])$
- enter $\alpha + \beta$ as $alpha + beta$
- $1 < x$ and $x < 5$, not $1 < x < 5$
- for list 1, 2, 3, 3 type [1, 2, 2, 3]
- for set type {1,2,3}
- $e^x \sin(bx)$ should be entered as $\exp(a * x) * \sin(b * x)$
- i or e is entered as $\%i$ respectively $\%e$
- x^2 is entered as x^2
- $\frac{3}{5x}$ is entered as $3/\{5 * x\}$

Platform Services benefits

- answers contain mathematical content;
- generates random structured questions;
- establish the mathematical properties of those answers;
- formative, summative and evaluative outcomes (i.e. feedback);
- stores all data for later analysis.
- Adaptability of online learning structures

2. STACK in Mathematics

Let $f(x) = k(x + a)^2 + b$ be a quadratic function. Investigate, how the graph of the function depends on the values of the parameters a, b and k.

a) Describe how different values of the parameters effect the shape of the graph.

b) Consider which functions have the point as their minimum point $(-1, -2)$.

c) Describe a general method to determine the values of the parameters a, b, and c, of the function $f(x) = k(x + a)^2 + b$, when the graph of the function is given.

a) Suggestion: The graph of the function $f(x) = x^2 + bx + c$ is a parabola with the vertex $V(x_V, y_V), x_V = -\frac{b}{2a}, y_V = f(x_V) = -\frac{\Delta}{4a}$.

For $k > 0$ we have $f_{min} = y_V = b, x_V = -a; V(-a, b)$

For $k < 0$ we have $f_{max} = y_V = b, x_V = -a; V(-a, b)$

For $k = 0$ we have $f(x) = b$, f is a constant function

b) Suggestion: The point $A(-1, -2)$ is a minimum point when $k > 0, a = 1, b = -2$. For example: $f(x) = k(x + 1)^2 - 2, k > 0$ and for $k = 1, f(x) = (x + 1)^2 - 2$,...

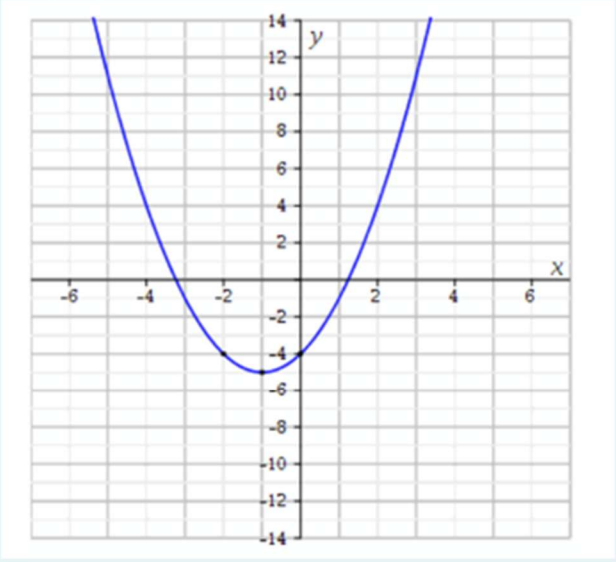
c) Suggestion: i) For the points: $A(-1, -2)$ and $A(x_0, y_0)$, we have $x_V = -a, y_V = b$, k will be determined from $f(x_0) = y_0$ or

ii) The distinct points $A_i(x_i, y_i), i = 1, 2, 3$ are given.

Tidy STACK question tool | Question is missing tests or variants.

Let $f(x) = k(x+a)^2 + b$ be a quadratic function. Investigate, how the graph of the function depends on the values of the parameters a, b and k.

d) The figure below shows the graph $y = f(x)$ of a quadratic function f. Use the method that you described in prompt c) to determine f. Use the method that you described in prompt c) to determine f.



$f(x)$ = 0

Your last answer was interpreted as follows:

$$0$$

✖ Incorrect answer.

One way to solve is the following: The minpoint $(-1,-3)$ implies that $a = -1$ and $b = -3$.

Thus, $f(x) = k(x+1)^2 - 3$. To get the value of, one more point on the graph needs to be used. This gives $k = 2$.

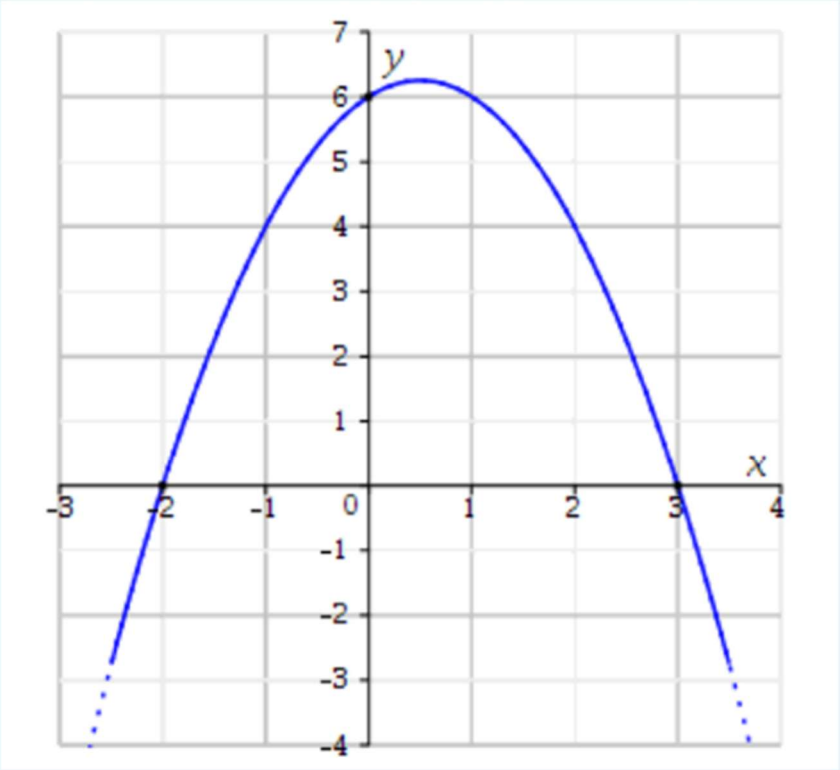
Thus, $f(x) = 2(x+1)^2 - 3$, alternatively (after rewriting): $f(x) = 2x^2 + 4x - 1$

A correct answer is $2 \cdot x^2 + 4 \cdot x - 1$, which can be typed in as follows: `2*x^2+4*x-1`

Tidy STACK question tool | Question is missing tests or variants.

Let $f(x) = k(x + a)^2 + b$ be a quadratic function. Investigate, how the graph of the function depends on the values of the parameters a, b and k.

e) The figure below shows the graph $y = h(x)$, where h is a quadratic function.



h(x) = 0

Your last answer was interpreted as follows:

0

✖ Incorrect answer.

$h(x) = k(x - (-2))(x - 3), k = -1$

$h(x) = -(x + 2)(x - 3)$, alternatively (after rewriting): $h(x) = -x^2 + x + 6$

A correct answer is $-x^2 + x + 6$, which can be typed in as follows: -x^2+x+6

Tidy STACK question tool | Question is missing tests or variants.

Enter the functional formula for
the linear function g that meet the following conditions: $g(4) = -3$ and $g^{-1}(3) = 1$

g(x) = 0

Your last answer was interpreted as follows:

$$0$$

✖ Incorrect answer.

$g : A \to B, g^{-1} : B \to A \Rightarrow (g^{-1} \circ g)(x) = x \in A, (g \circ g^{-1})(x) = x \in B$

$g(x) = ax + b$ check the relations:

i) $g(4) = -3, 4a + b = -3$

ii) $g^{-1}(3) = 1, g(g^{-1}(3)) = g(1) = a + b = 3$

$\Rightarrow g(x) = -2x + 5$

A correct answer is $5 - 2 \cdot x$, which can be typed in as follows: 5-2*x

Investigate, by using GeoGebra, how the graph of the trigonometric function $f(x) = A\ sin(B(x + C)) + D$, depends on the values of the parameters A, B, C and D.

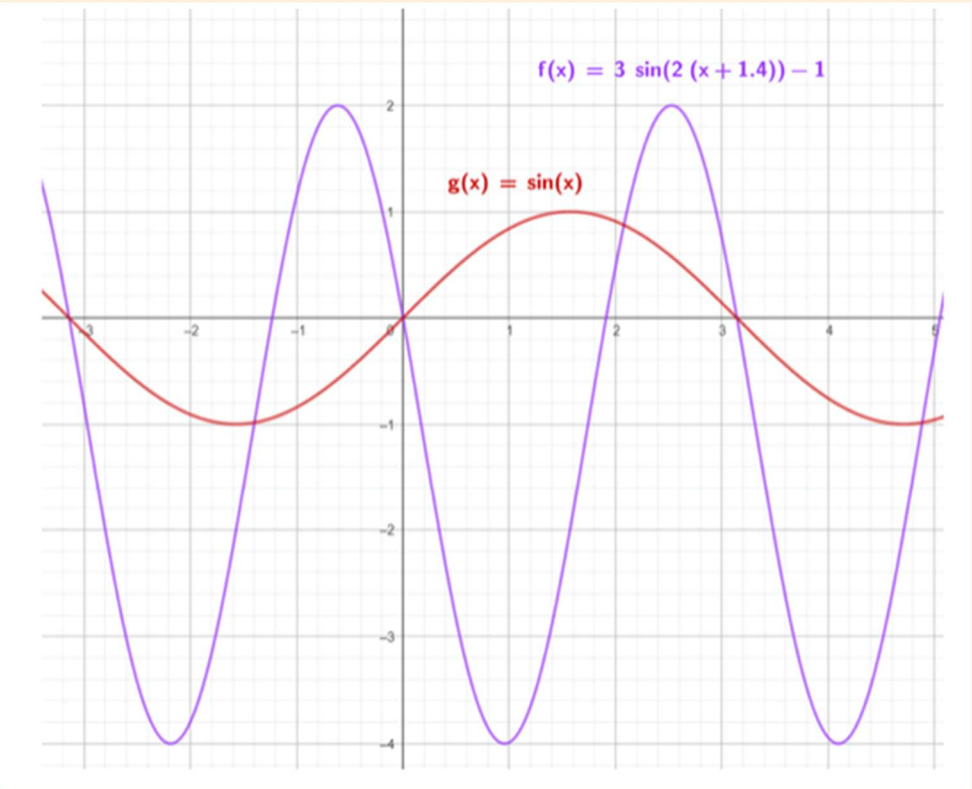
a) Describe in what way the various parameters alter the graph.

a) The A value determines the amplitude.

The B value is the angular frequency of the periodic curve and determines the length of period one of the curve.

The C value moves the graph in x joint, when the graph moves one at right becomes c negative.

D values moves the graph in y joint.



Investigate, by using GeoGebra, how the graph of the trigonometric function $f(x) = A\,sin(B(x + C)) + D$, depends on the values of the parameters A, B, C and D.

b) Consider what has to be fulfilled for a trigonometric function to have the range $-2 \leq y \leq 4$. Then use GeoGebra to check if this holds. When you are convinced that your assumption is correct, provide two different functions that fulfil the given condition.

Suggestion:

$f(x) = 3sinx - 1$

$g(x) = 3sin(-2(x + \pi)) - 1$

Let $f : \mathbb{R} \to (0, \infty)$, $f(x) = e^{-2x}$, $g : (0, \infty) \to (1, \infty)$, $g(x) = \frac{1}{e^{-2x}}$ and $h : (0, \infty) \to \mathbb{R}$, $h(x) = -\frac{1}{2}lnx$. Which of the following statement(s) is/are true?

- a. g and h are inverses of each other.
- b. None of f, g or h are inverses of each other.
- c. f and h are inverses of each other. ✔
- d. f and g are inverses of each other.

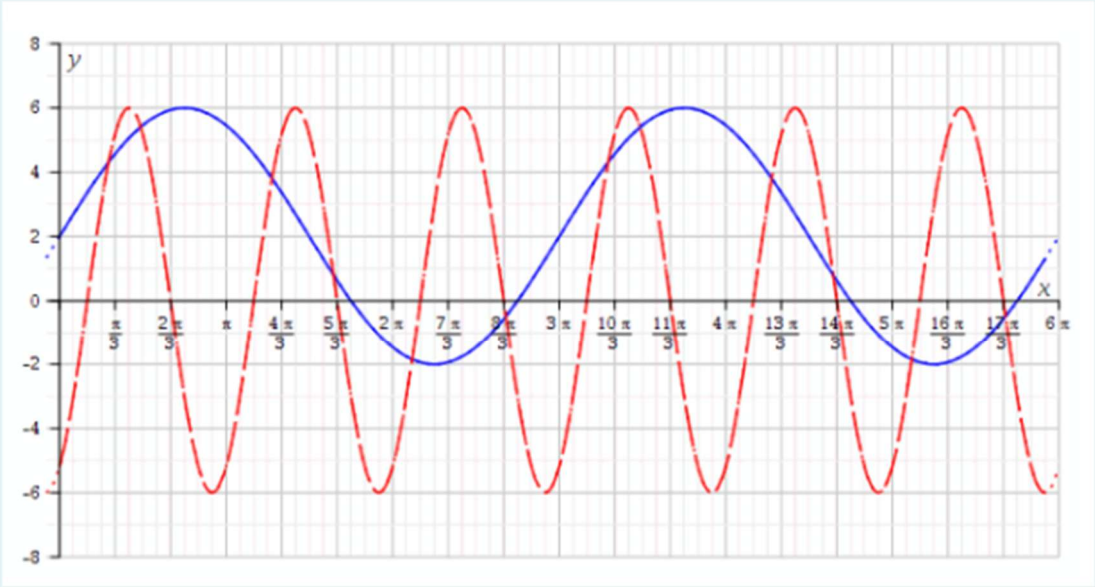
Your answer is correct.

The correct answer is:
f and h are inverses of each other.

Tidy STACK question tool | Question is missing tests or variants.

Investigate, by using GeoGebra,
how the graph of the trigonometric function $f(x) = A\ sin(B(x + C)) + D$, depends on the values of the parameters A, B, C and D.

c) How the graph $y = h(x)$ of the trigonometric function $h(x) = A\ sin(B(x + C)) + D$ can be used to determine the values of the parameters A, B and D



A = 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

The amplitude is $A = \frac{1-(-3)}{2} = 2$. Reading the graph we get the period length equal to π. This implies that $B = \frac{2\pi}{\pi} = 2$. Compare to $y = 2\sin(2x)$ is the translation on the y -axis 1 unit down. This implies that $D = -1$.

Overall, one gets $p(x) = 2\sin(2x) - 1$.

With similar reasoning for $y = q(x)$ /dashed line/and translation on x -axis, one gets $q(x) = 4\sin\left(1\left(x - \frac{1}{6}\pi\right)\right)$

B = 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

The amplitude is $A = \frac{1-(-3)}{2} = 2$. Reading the graph we get the period length equal to π. This implies that $B = \frac{2\pi}{\pi} = 2$. Compare to $y = 2\sin(2x)$ is the translation on the y -axis 1 unit down. This implies that $D = -1$.

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D = 0

Your last answer was interpreted as follows:

$$0$$

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With similar reasoning for $y = q(x)$ /dashed line/and translation on x -axis, one gets $q(x) = 4\sin\left(1\left(x - \frac{1}{6}\pi\right)\right)$

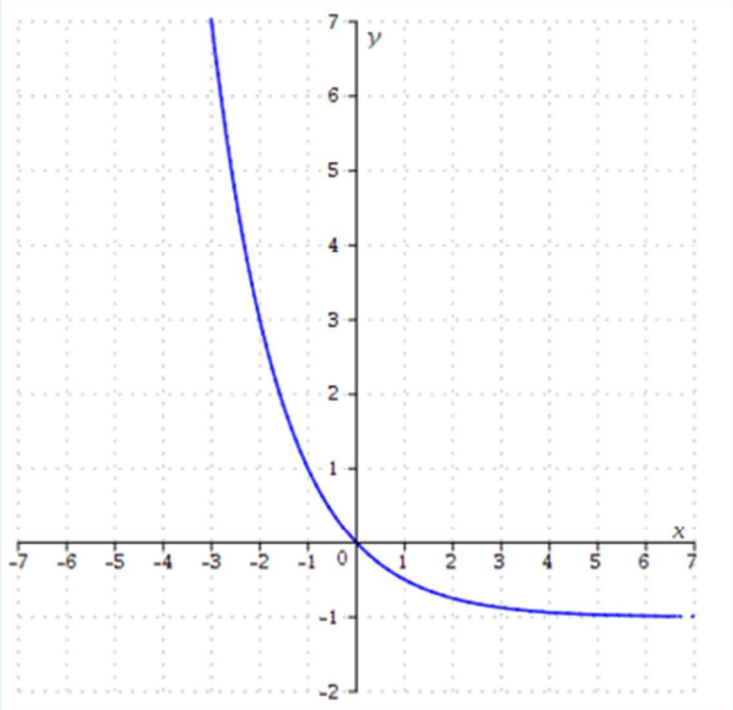
A correct answer is 2, which can be typed in as follows: 2

A correct answer is 2, which can be typed in as follows: 2

A correct answer is -1, which can be typed in as follows: -1

Tidy STACK question tool | Question is missing tests or variants.

The figure below shows the graph $y = f(x)$, where f is a given function.



Use the graph to answer the question. Round to the nearest integer.

a) $f^{-1}(3) =$ 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

Generally $f^{-1}(3) = x \Leftrightarrow f(x) = 3$ x value which fulfills $f(x) = 3$ (using reading of the graph) is $x = -2$.

b) $f(-2) =$ 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

From the graph we get $f(-2) = 3$

c) $f^{-1}(f(-2)) =$ 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

$f^{-1}(f(-2)) = f^{-1}(3) = -2$

d) $f(f^{-1}(3)) =$ 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

$f\left(f^{-1}(3)\right) = f(-2) = 3$

A correct answer is -2, which can be typed in as follows: -2

A correct answer is 3, which can be typed in as follows: 3

A correct answer is -2, which can be typed in as follows: -2

A correct answer is 3, which can be typed in as follows: 3

Tidy STACK question tool | Question is missing tests or variants.

Let $f : (0, \infty) \to (0, 1)$, $f(x) = e^{-2x}$, $g : (0, \infty) \to (1, \infty)$, $g(x) = \frac{1}{e^{-2x}}$ and $h : (0, \infty) \to \mathbb{R}$, $h(x) = -\frac{1}{2}lnx$. Determine the following composite functions:

a) $(f \circ g)(x) = f(g(x)) =$ 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

$f \circ g : (0, \infty) \to (0, 1), (f \circ g)(x) = f(g(x)) = e^{-2e^{2x}} \neq x$

b) $(f \circ h)(x) = f(h(x)) =$ 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

$f \circ h : (0, 1) \to (0, 1), (f \circ h)(x) = f(h(x)) = x \in (0, 1)$

c) $(h \circ f)(x) = h(f(x)) =$ 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

$h \circ f : (0, \infty) \to \mathbb{R}, (h \circ f)(x) = h(f(x)) = x \in (0, \infty)$

A correct answer is $e^{\{-2 \cdot e^{\{2 \cdot x\}}\}}$, which can be typed in as follows: `%e^{-(2*%e^{2*x})}`

A correct answer is x, which can be typed in as follows: `x`

A correct answer is x, which can be typed in as follows: `x`

Tidy STACK question tool | Question is missing tests or variants.

Let the function
$f(x) = ln(2x + 5)$.

i) Enter the expression for f^{-1}

$f^{-1}(x) =$

Let the function $f(x) = \ln(2x + 5)$.

ii) Determine the domain of f^{-1}. Mark the correct alternative.

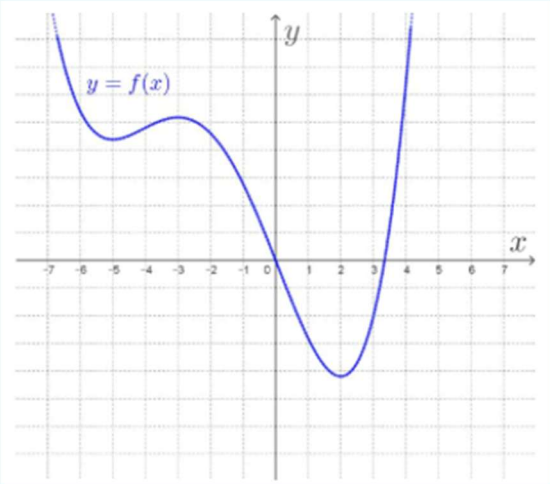
- a. $\left(-\frac{5}{2}, \frac{5}{2}\right)$
- b. $\left(-\infty, \frac{5}{2}\right)$
- c. $\left(-\frac{5}{2}, \infty\right)$
- d. $\left(-\frac{2}{5}, \infty\right)$
- e. None of these alternatives.
- f. $\left(-\infty, -\frac{5}{2}\right)$
- g. $\mathbb{R}$

Let the function $f(x) = \ln(2x + 5)$.

iii) Determine the codomain of f^{-1}. Mark the correct alternative.

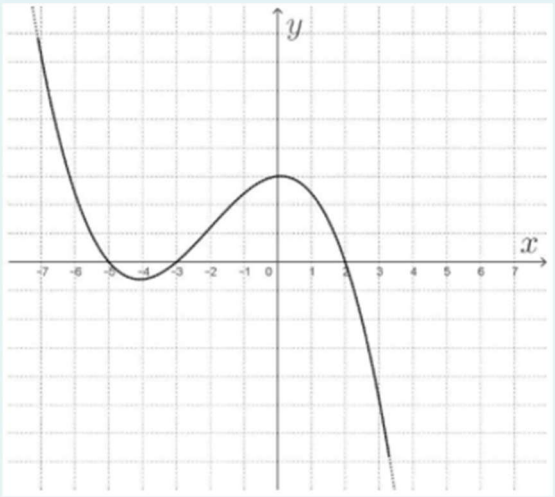
- a. $\left(-\infty, \frac{5}{2}\right)$
- b. $\left(-\frac{5}{2}, \frac{5}{2}\right)$
- c. None of these alternatives.
- d. $\left(-\frac{5}{2}, \infty\right)$
- e. $\left(-\infty, -\frac{5}{2}\right)$
- f. $\mathbb{R}$
- g. $\left(-\frac{2}{5}, \infty\right)$

The figure below shows the curve $y = f(x)$, where f is a given function.

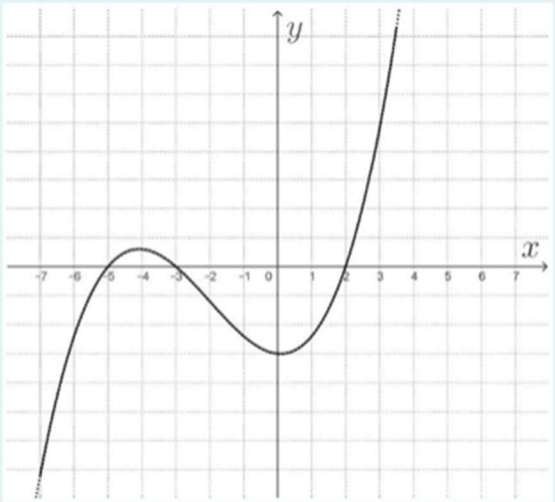


Which of the following depict the graph of the first derivative of f, i.e. the curve $y = f'(x)$? Mark the alternative(s) that is/are correct.

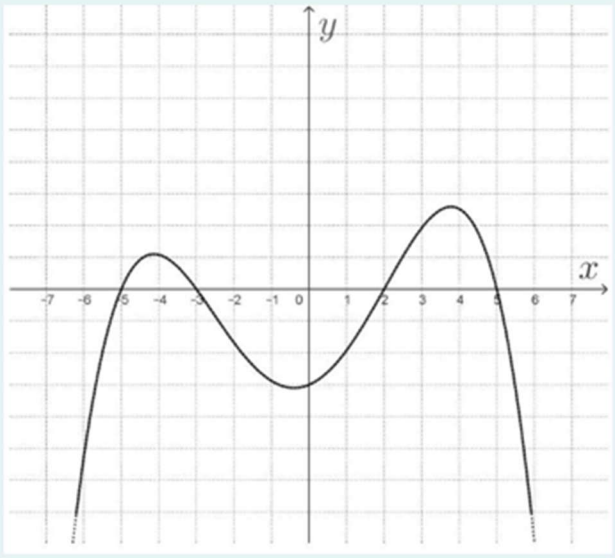
a.



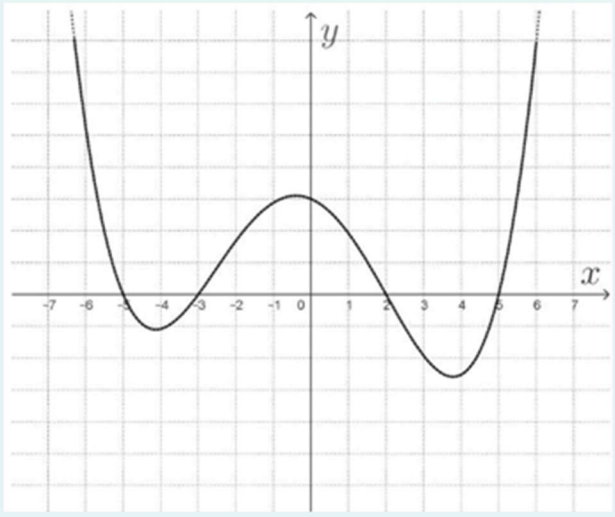
b.



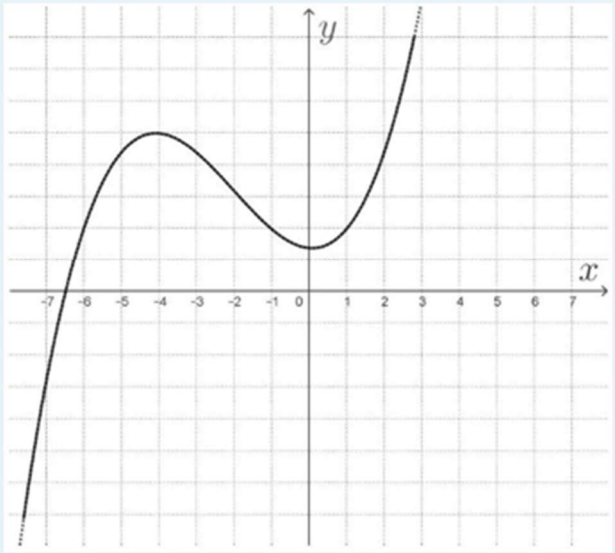
c.


y
x
-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

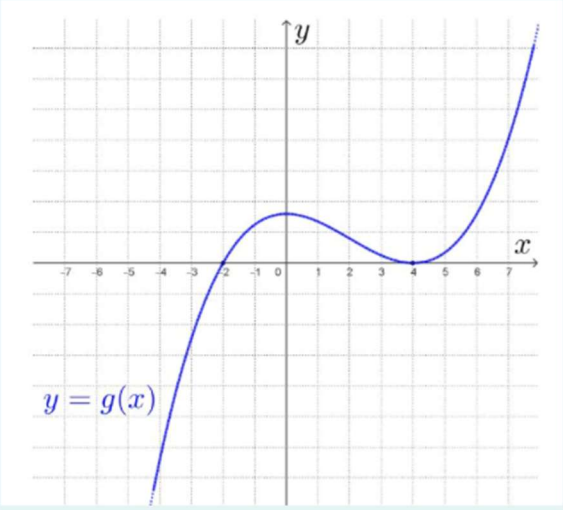
d.


y
x
-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

e.

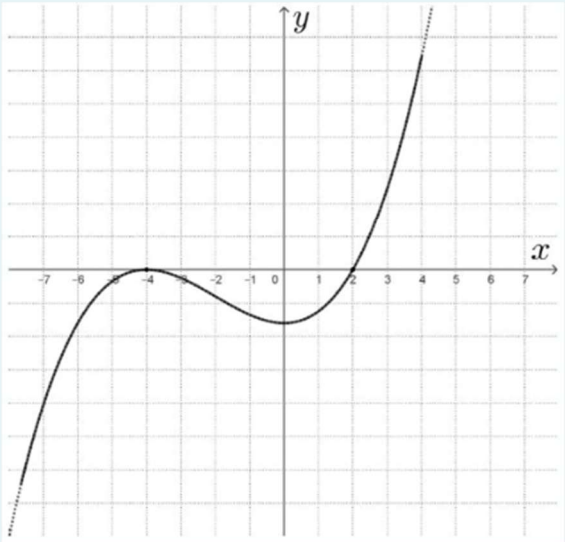

y
x
-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

The figure below shows the curve $y = g(x)$, where g is a given function.

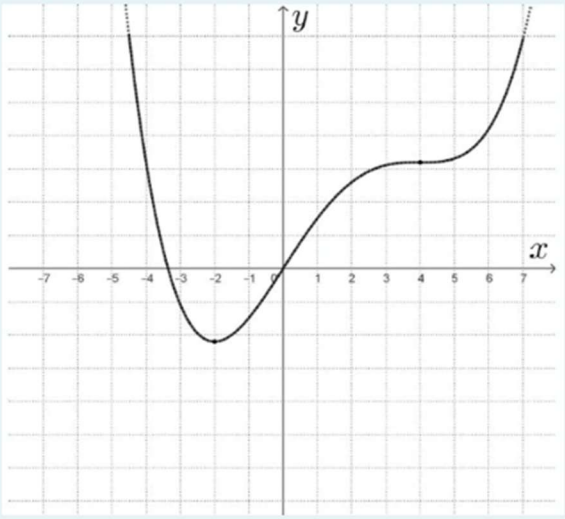


Which of the following depict the graph of a function that has g as its first derivative? Mark the alternative(s) that is/are correct.

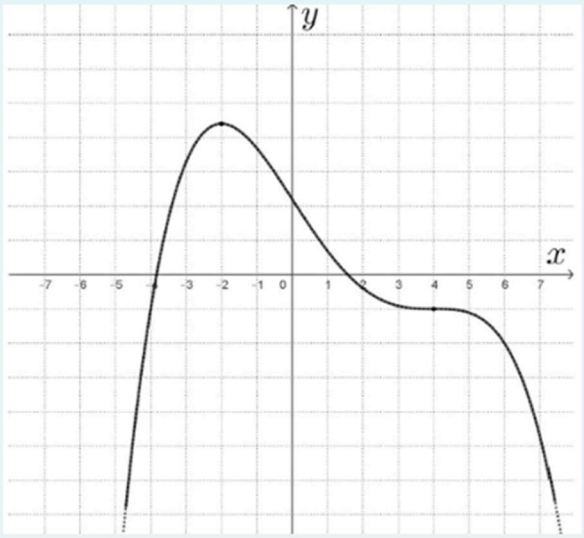
a.



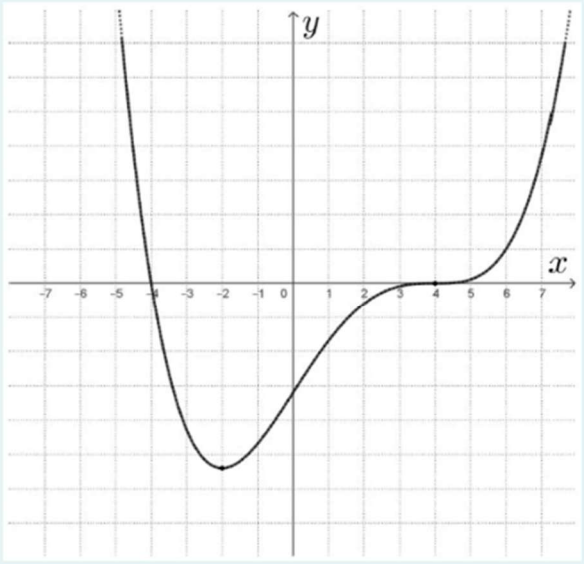
b.



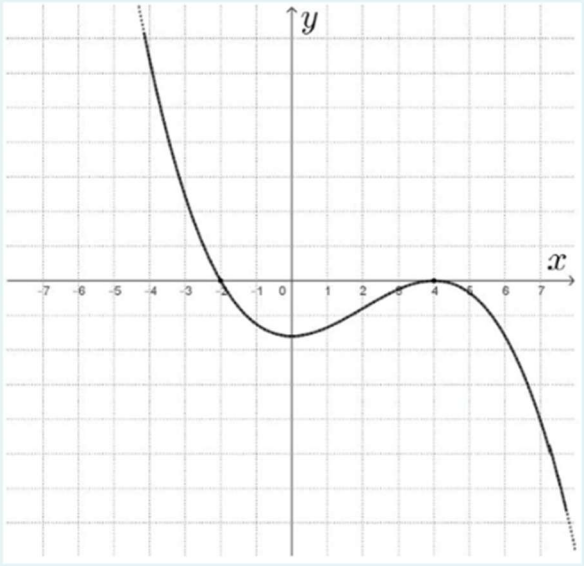
c.


y
x
-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

d.

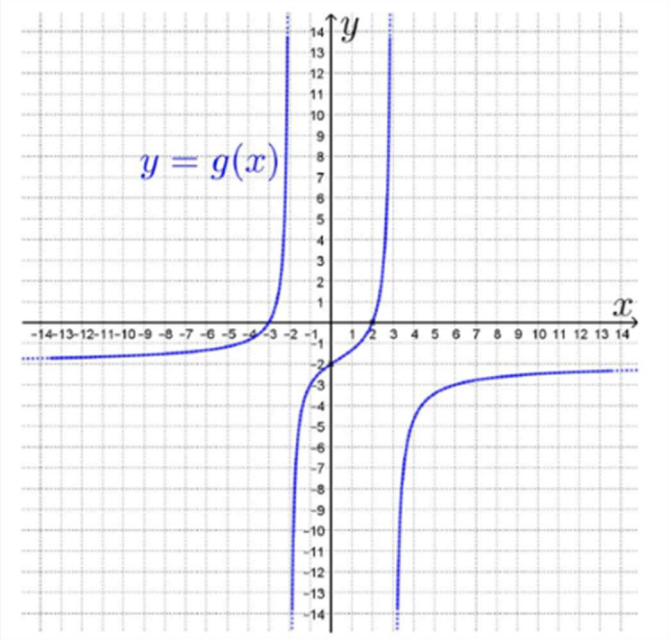

y
x
-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

e.


y
x
-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

Tidy STACK question tool | Question is missing tests or variants.

The figure above shows the graph of the function g.

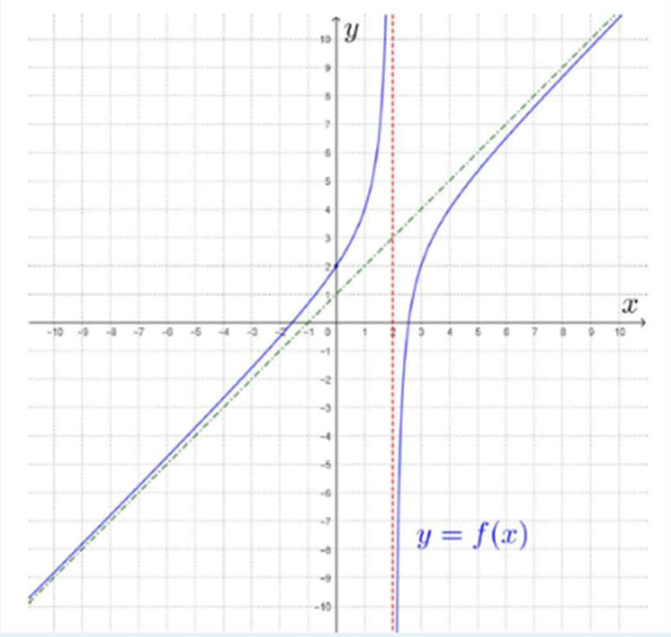


Use the graph determine the functional formula for $g(x)$.

$g(x)$ =

Tidy STACK question tool | Question is missing tests or variants.

The figure above shows the graph of the function f and its asymptotes. Use the graph to determine the function formula for f.



$f(x)$ =

What is a matrix?

a. a complicated number system
b. a set of numbers in rows and columns
c. a method of finding the n^{th} value of a series
d. an equation of over 5 numbers or symbols

Your answer is incorrect.
Let $M_1 = \{1, 2, \ldots, m\}, M_2 = \{1, 2, \ldots, n\}$, $\mathbb{C}$ set of complex numbers. A function $A : M_1 x M_2 \to \mathbb{C}$, $A(i, j) = a_{ij}$ is called a matrix of type (m, n) with elements complex numbers. A matrix has the general form

$$A = \begin{pmatrix} a11 & a12 & \ldots & a1n \\ a21 & a22 & \ldots & a2n \\ \ldots & \ldots & \ldots & \ldots \\ am1 & am2 & \ldots & amn \end{pmatrix}.$$

A matrix is a rectangular grid with m rows and n columns or $A = ||a_{ij}||_{\substack{i=\overline{1,m} \\ j=\overline{i,n}}}$

The correct answer is:
a set of numbers in rows and columns

What is the name of each entry of a matrix?

a. numbers
b. row
c. element
d. dimension

Your answer is incorrect.
The element is the entry of a matrix.

The correct answer is:
element

How many columns are in a 5×4 matrix?

- a. 20
- b. 9
- c. 4
- d. 5

Your answer is incorrect.
The $m \times n$ matrix has m row and n column.

The correct answer is:
4

How many rows are in a 7×3 matrix?

- a. 21
- b. 3
- c. 10
- d. 7

Your answer is incorrect.
The $m \times n$ matrix has m row and n column.

The correct answer is:
7

The transpose of a 5×6 matrix has six columns and five rows.

Select one:

- True
- False

The correct answer is 'False'.

Dimension/size: $\begin{pmatrix} 0 & -1 & 3 & 12 & 5 \\ 8 & 0 & 8 & 4 & 2 \\ 4 & 6 & 0 & 9 & 1 \end{pmatrix}$.

- a. 5×3
- b. 4×5
- c. 3×5
- d. 5×4

Your answer is incorrect.
The dimensions of a matrix tells its size: the number of rows and columns of the matrix, in that order.
The matrix A has 3 rows and 5 columns, so it is a 3×5 matrix.

The correct answer is:
3×5

What must be true in order to add two matrices?

- a. the dimensions/size must be equal
- b. they must be square
- c. the determinant can't equal 0
- d. the column of the 1^{st} must equal the row of the 2^{nd}

Your answer is incorrect.
A matrix can only be added to another matrix if the two matrices have the same dimensions.

The correct answer is:
the dimensions/size must be equal

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Add the matrices:

$A = \begin{pmatrix} 5 & 5 \\ 1 & -2 \end{pmatrix}, B = \begin{pmatrix} 7 & 3 \\ -5 & 4 \end{pmatrix}$

- a. $\begin{pmatrix} 10 & 8 \\ -6 & 2 \end{pmatrix}$
- b. $\begin{pmatrix} 12 & 8 \\ -4 & 2 \end{pmatrix}$
- c. $\begin{pmatrix} 3 & 2 \\ -6 & -6 \end{pmatrix}$
- d. $\begin{pmatrix} -3 & 2 \\ -4 & -6 \end{pmatrix}$

Your answer is incorrect.
To add two matrices, just add the corresponding entries, and place this sum in the corresponding position in the matrix which results.

$A + B = \begin{pmatrix} 5 & 5 \\ 1 & -2 \end{pmatrix} + \begin{pmatrix} 7 & 3 \\ -5 & 4 \end{pmatrix} = \begin{pmatrix} 5+7 & 5+3 \\ 1-5 & -2+4 \end{pmatrix} = \begin{pmatrix} 12 & 8 \\ -4 & 2 \end{pmatrix}$

The correct answer is:

$\begin{pmatrix} 12 & 8 \\ -4 & 2 \end{pmatrix}$

Substract the matrices:

$A = \begin{pmatrix} 3 & -6 \\ 4 & -1 \end{pmatrix}, B = \begin{pmatrix} 0 & -2 \\ -4 & 6 \end{pmatrix}$

- a. $\begin{pmatrix} 3 & -4 \\ 8 & -7 \end{pmatrix}$
- b. $\begin{pmatrix} -3 & 8 \\ 0 & 1 \end{pmatrix}$
- c. $\begin{pmatrix} 3 & -8 \\ 0 & -1 \end{pmatrix}$
- d. $\begin{pmatrix} 3 & -8 \\ -8 & 1 \end{pmatrix}$

Your answer is incorrect.
To substract two matrices, just substract the corresponding entries, and place this difference in the corresponding position in the matrix which results.

$A - B = \begin{pmatrix} 3 & -6 \\ 4 & -1 \end{pmatrix} - \begin{pmatrix} 0 & -2 \\ -4 & 6 \end{pmatrix} = \begin{pmatrix} 3-0 & -6-(-2) \\ 4-(-4) & -1-6 \end{pmatrix} = \begin{pmatrix} 3 & -4 \\ 8 & -7 \end{pmatrix}$

The correct answer is:

$\begin{pmatrix} 3 & -4 \\ 8 & -7 \end{pmatrix}$

Multiply as necessary:

$$5 \cdot \begin{pmatrix} -4 & 3 & -2 \\ 6 & -1 & 0 \end{pmatrix}$$

- a. $\begin{pmatrix} 20 & -15 & 10 \\ -30 & 5 & 0 \end{pmatrix}$
- b. $\begin{pmatrix} 20 & 15 & -10 \\ 30 & -5 & 0 \end{pmatrix}$
- c. $\begin{pmatrix} 1 & 8 & 3 \\ 11 & 4 & 5 \end{pmatrix}$
- d. $\begin{pmatrix} -20 & 15 & -10 \\ 30 & -5 & 0 \end{pmatrix}$

Your answer is incorrect.
In scalar multiplication (refers to the product of a real number and a matrix), each entry in the matrix is multiplied by the given scalar.

$$5 \cdot \begin{pmatrix} -4 & 3 & -2 \\ 6 & -1 & 0 \end{pmatrix} = \begin{pmatrix} -20 & 15 & -10 \\ 30 & -5 & 0 \end{pmatrix}$$

The correct answer is:

$$\begin{pmatrix} -20 & 15 & -10 \\ 30 & -5 & 0 \end{pmatrix}$$

Compute $A \cdot B$ where:

$$A = \begin{pmatrix} 3 & 4 & 0 \\ 2 & 7 & 1 \\ 6 & 5 & 7 \end{pmatrix}, B = \begin{pmatrix} 2 & 2 & 8 \\ 5 & 7 & 0 \\ 6 & 4 & 3 \end{pmatrix}$$

a. $\begin{pmatrix} 26 & 24 & 34 \\ 45 & 57 & 19 \\ 69 & 75 & 71 \end{pmatrix}$

b. $\begin{pmatrix} 45 & 24 & 10 \\ 45 & 57 & 19 \\ 14 & 80 & 70 \end{pmatrix}$

c. $\begin{pmatrix} 79 & 75 & 69 \\ 45 & 57 & 19 \\ 26 & 34 & 24 \end{pmatrix}$

d. $\begin{pmatrix} 26 & 34 & 24 \\ 45 & 57 & 19 \\ 79 & 75 & 69 \end{pmatrix}$

e. not possible

Your answer is incorrect.
If the answer is wrong: Let $A = ||a_{ij}||_{\substack{i=\overline{1,m} \\ j=\overline{i,n}}}$ and $B = ||b_{ij}||_{\substack{i=\overline{1,n} \\ j=\overline{i,p}}}$. The matrix product AB is the $m \times p$ matrix whose i, j entry is

$\sum_{k=1}^{n} a_{ik} b_{kj}$

Remark: We can define the product $A \cdot B$ when the number of columns of A is the same as the number of rows of B.

$$A \cdot B = \begin{pmatrix} 3 & 4 & 0 \\ 2 & 7 & 1 \\ 6 & 5 & 7 \end{pmatrix} \cdot \begin{pmatrix} 2 & 2 & 8 \\ 5 & 7 & 0 \\ 6 & 4 & 3 \end{pmatrix} =$$

$$= \begin{pmatrix} 3 \cdot 2 + 4 \cdot 5 + 0 \cdot 6 & 3 \cdot 2 + 4 \cdot 7 + 0 \cdot 4 & 3 \cdot 8 + 4 \cdot 0 + 0 \cdot 3 \\ 2 \cdot 2 + 7 \cdot 5 + 1 \cdot 6 & 2 \cdot 2 + 7 \cdot 7 + 1 \cdot 4 & 2 \cdot 8 + 7 \cdot 0 + 1 \cdot 3 \\ 6 \cdot 2 + 5 \cdot 5 + 7 \cdot 6 & 6 \cdot 2 + 5 \cdot 7 + 7 \cdot 4 & 6 \cdot 8 + 5 \cdot 0 + 7 \cdot 3 \end{pmatrix} =$$

$$= \begin{pmatrix} 26 & 34 & 24 \\ 45 & 57 & 19 \\ 79 & 75 & 69 \end{pmatrix}$$

The correct answer is:

$\begin{pmatrix} 26 & 34 & 24 \\ 45 & 57 & 19 \\ 79 & 75 & 69 \end{pmatrix}$

Compute $A \cdot B$ where

$$A = \begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix}, B = \begin{pmatrix} 1 & 3 & 5 \end{pmatrix}$$

- a. $\begin{pmatrix} 2 & 9 & 10 \\ 3 & 6 & 15 \\ 4 & 20 & 12 \end{pmatrix}$
- b. $\begin{pmatrix} 2 & 1 & 1 \\ 3 & 3 & 4 \\ 4 & 12 & 20 \end{pmatrix}$
- c. not possible
- d. $\begin{pmatrix} 2 & 6 & 10 \\ 3 & 9 & 15 \\ 4 & 12 & 20 \end{pmatrix}$

Your answer is incorrect.

A is a 3×1 matrix, B is a 1×3 matrix $\Rightarrow A \cdot B$ is a 3×3 matrix.

$$A \cdot B = \begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix} \cdot \begin{pmatrix} 1 & 3 & 5 \end{pmatrix} = \begin{pmatrix} 2 & 6 & 10 \\ 3 & 9 & 15 \\ 4 & 12 & 20 \end{pmatrix}$$

The correct answer is:

$$\begin{pmatrix} 2 & 6 & 10 \\ 3 & 9 & 15 \\ 4 & 12 & 20 \end{pmatrix}$$

Compute $A \cdot B$ where

$$A = \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix}, B = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$$

a. $\begin{pmatrix} 1 & 25 \end{pmatrix}$

b. $\begin{pmatrix} 2 & 25 \\ 7 & 3 \end{pmatrix}$

c. not posible

d. $\begin{pmatrix} 2 & 25 \end{pmatrix}$

e. $\begin{pmatrix} 2 \\ 7 \\ 25 \end{pmatrix}$

Your answer is incorrect.
A is a 3×1 matrix, B is a 2×1 matrix $\Rightarrow$ is not possible to compute $A \cdot B$, because the number of columns of A is not the same as the number of rows of B.

The correct answer is:
not posible

If A and B are 2×2 matrices such that $AB = 0$, then $BA = 0$.

Select one:

True

False

The correct answer is 'False'.

If $AB = 0$, then either A or B is a zero matrix.

Select one:

True

False

The correct answer is 'False'.

Can you multiply a 3×4 matrix with a 4×2 matrix?

- a. no
- b. yes

Your answer is incorrect.
We can define the product $A \cdot B$ when the number of columns of A is the same as the number of rows of B.

The correct answer is:
yes

You can multiply a 2×3 matrix by which matrix below?

- a. 2×3
- b. 3×12
- c. 2×2
- d. 2×12

Your answer is incorrect.
The $(2, 3)$ matrix can be multiply by any $(3, p)$ matrix, $p \in \mathbb{N}^*$ the product is a matrix of the type $(2, p)$
.

The correct answer is:
3×12

These matrices are being multiplied. Determine the dimension/size of the new matrix

$$A = \begin{pmatrix} 6 & 4 & -3 \\ 2 & 1 & -5 \\ -1 & 6 & -7 \\ 3 & 1 & 7 \end{pmatrix}, B = \begin{pmatrix} 1 & 3 & 2 \\ 4 & -1 & 6 \end{pmatrix}$$

a. 3×3
b. can't multiply them
c. 4×3
d. 4×2

Your answer is incorrect.
A is a 4×3 matrix, B is a 2×3 matrix $\Rightarrow$ is not possible to compute $A \cdot B$, because the number of columns of A is not the same as the number of rows of B.

The correct answer is:
can't multiply them

"Not invertible" is the same thing as "singular".

Select one:
True
False

The correct answer is 'True'.

If a sistem of linear equations is represented by $AX = B$ and A is invertible, then the system has a unique solution.

Select one:
True
False

The correct answer is 'True'.

What is the determinant of the matrix

$\begin{pmatrix} -3 & 5 \\ -2 & -7 \end{pmatrix}$?

- a. -31
- b. -20
- c. 31
- d. -29
- e. -24

Your answer is incorrect.
The value of a second-order determinant is equal to the product of the elements on the principal diagonal, minus the product of the elements on the secondary diagonal.

If $A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$ then $detA = \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} = a_{11} \cdot a_{22} - a_{12} \cdot a_{21}$

$\begin{vmatrix} -3 & 5 \\ -2 & -7 \end{vmatrix} = -3 \cdot (-7) - 5 \cdot (-2) = 21 + 10 = 31$

The correct answer is:
31

Calculate the determinant of the matrix

$$\begin{pmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \end{pmatrix}$$

a. 4

b. 0

c. 6

d. 3

Your answer is incorrect.

Solution 1.

If $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$, then the triangle rule is $detA = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$

$= a_{11} \cdot a_{22} \cdot a_{33} + a_{21} \cdot a_{32} \cdot a_{13} + a_{12} \cdot a_{23} \cdot a_{31} - a_{13} \cdot a_{22} \cdot a_{31} - a_{23} \cdot a_{32} \cdot a_{11} - a_{12} \cdot a_{21} \cdot a_{33}$

or we can apply the rule of Sarrus

$$detA = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \\ a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{vmatrix}$$

$= a_{11} \cdot a_{22} \cdot a_{33} + a_{21} \cdot a_{32} \cdot a_{13} + a_{12} \cdot a_{23} \cdot a_{31} - a_{13} \cdot a_{22} \cdot a_{31} - a_{23} \cdot a_{32} \cdot a_{11} - a_{12} \cdot a_{21} \cdot a_{33}$

Solution 2.

If two rows/columns of a matrix are identical then $detA = 0$.

The correct answer is:

0

Calculate the trace of the matrix

$$\begin{pmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \end{pmatrix}$$

- a. 4
- b. 6
- c. 3
- d. 0

Your answer is incorrect.
Trace of a matrix is defined as the sum of the principal diagonal elements of a square matrix. It is usually represented as $tr(A)$.

Let $A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix}$, then $tr(A) = a_{11} + a_{22} + \cdots + a_{nn}$

$tr(A) = 1 + 2 + 3 = 6$

The correct answer is:
6

Calculate the rank of the matrix

$$\begin{pmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \end{pmatrix}$$

a. 2
b. 1
c. 4
d. 0

Your answer is incorrect.
If

$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix}$, $a_{ij} \in \mathbb{C}, i = \overline{1,m}, j = \overline{1,n}$, then by minor of the order $r \leq min(m,n), r \in \mathbb{N}^*$ is understood the determinant whose elements are the points of intersection of lines $i_1, i_2, \cdots, i_r$, with colomns $j_1, j_2, \cdots, j_r$,

$$\Delta = \begin{vmatrix} a_{i_1,j_1} & a_{i_1,j_2} & \cdots & a_{i_1,j_r} \\ a_{i_2,j_1} & a_{i_2,j_2} & \cdots & a_{i_2,j_r} \\ \cdots & \cdots & \cdots & \cdots \\ a_{i_r,j_1} & a_{i_r,j_2} & \cdots & a_{i_r,j_r} \end{vmatrix}$$

Matrix A has the rank r if A contains a non zero minor of order r, and all minors of order higher than r (if exists) are zero. Notation: $rankA = r$.

For $A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \end{pmatrix}$ we can observed that all the minors of second order and the minor of third order are zero (the determinate that has 2 identical rows/columns is 0). So, $rankA = 1$.

The correct answer is:
1

Find the eigenvalues of the matrix

$$A = \begin{pmatrix} 5 & -3 \\ 1 & -2 \end{pmatrix}$$

a. (-4.54 -1.54)

b. (-4.54 1.54)

c. (4.54 -1.54)

d. (4.54 1.54)

Your answer is incorrect.

Eigenvalues of the real type (m, n) matrix are the real solutions of the equation $\det(A - \lambda I_n) = 0$, where I_n is identity matrix (square matrix with ones on the main diagonal and zeros elsewhere).

If $A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$ then $detA = \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} = a_{11} \cdot a_{22} - a12 \cdot a_{22}$

If $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$, then the triangle rule is $detA = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$

$= a_{11} \cdot a_{22} \cdot a_{33} + a_{21} \cdot a_{32} \cdot a_{13} + a_{12} \cdot a_{23} \cdot a_{31} - a_{13} \cdot a_{22} \cdot a_{31} - a_{23} \cdot a_{32} \cdot a_{11} - a_{12} \cdot a_{21} \cdot a_{33}$

or we can apply the rule of Sarrus $detA = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \\ a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{vmatrix}$

$= a_{11} \cdot a_{22} \cdot a_{33} + a_{21} \cdot a_{32} \cdot a_{13} + a_{12} \cdot a_{23} \cdot a_{31} - a_{13} \cdot a_{22} \cdot a_{31} - a_{23} \cdot a_{32} \cdot a_{11} - a_{12} \cdot a_{21} \cdot a_{33}$

For $A = \begin{pmatrix} 5 & -3 \\ 1 & -2 \end{pmatrix}$, we have $I_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$,

$$det(A - \lambda I_n) = \begin{vmatrix} 5 - \lambda & -3 \\ 1 & -2 - \lambda \end{vmatrix} = (5 - \lambda) \cdot (-2 - \lambda) + 3.$$

$$det(A - \lambda I_n) = 0 \Leftrightarrow (5 - \lambda) \cdot (-2 - \lambda) + 3 = 0 \Leftrightarrow \lambda^2 - 3\lambda - 7 = 0 \Rightarrow$$

$$\lambda_1 = \frac{3+\sqrt{37}}{2} \simeq 4.54, \lambda_2 = \frac{3-\sqrt{37}}{2} \simeq -1.54$$

The correct answer is:
(4.54 -1.54)

Calculate the inverse of

$$A = \begin{pmatrix} 1 & 5 \\ 2 & 4 \end{pmatrix}$$

a. 2

b. $\begin{pmatrix} -\frac{2}{3} & \frac{5}{6} \\ \frac{1}{3} & -\frac{1}{6} \end{pmatrix}$

c. $\begin{pmatrix} 2 & 3 \\ 5 & 6 \end{pmatrix}$

d. $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

Your answer is incorrect.
Aquadratic matrix A of order n is invertible if there exist a quadratic matrix B of order n, such that :

$$AB = BA = I_n$$

B represent the inverse matrix of A and it is denoted by $B = A^{-1}$. From the relation

$$AA^{-1} = A^{-1}A = I_n$$

we have $\det A \neq 0$. If $\det A = 0$, then A is not invertible.

To construct A^{-1}, we follow the steps:

i) calculate $\det A$

ii) write the transposed matrix A^T (the transpose of a matrix is obtained by changing its rows into columns (or equivalently, its columns into rows)).

iii) calculate

$$A^* = \begin{pmatrix} A_{11} & A_{12} & \cdots & A_{1n} \\ A_{21} & A_{22} & \cdots & A_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ A_{n1} & A_{n2} & \cdots & A_{nn} \end{pmatrix}$$

where $A_{ij} = (-1)^{i+j} \cdot \Delta_{i,j}, i, j \in \{1, 2, \ldots, n\}$
$\Delta_{i,j}$ write the transposed matrix A^T (the transpose of a matrix is obtained by changing its rows into columns (or equivalently, its columns into rows)).
iv) $A^{-1} = \frac{1}{detA} \cdot A^*$
In our case,

$$detA = \begin{vmatrix} 1 & 5 \\ 2 & 4 \end{vmatrix} = 4 - 10 = -6,$$

$$A^T = \begin{pmatrix} 1 & 2 \\ 5 & 4 \end{pmatrix},$$

$$A^* = \begin{pmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{pmatrix}, \text{ where}$$

$$A_{11} = (-1)^{1+1} \cdot 4 = 4$$
$$A_{12} = (-1)^{1+2} \cdot 5 = -5$$
$$A_{21} = (-1)^{2+1} \cdot 2 = -2$$
$$A_{22} = (-1)^{2+2} \cdot 1 = 1$$

In conclusion,

$$A^* = \begin{pmatrix} 4 & -5 \\ -2 & 1 \end{pmatrix}$$

and

$$A^{-1} = \frac{1}{detA} \cdot A^* = -\frac{1}{6}\begin{pmatrix} 4 & -5 \\ -2 & 1 \end{pmatrix} = \begin{pmatrix} -\frac{2}{3} & \frac{5}{6} \\ \frac{1}{3} & -\frac{1}{6} \end{pmatrix}$$

The correct answer is:

$$\begin{pmatrix} -\frac{2}{3} & \frac{5}{6} \\ \frac{1}{3} & -\frac{1}{6} \end{pmatrix}$$

Determine it the matrix

$$A = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$$

is orthogonal or not.

- a. orthogonal
- b. not orthogonal

Your answer is incorrect.
A square matrix A of order n is an orthogonal matrix if $A^T = A^{-1}$ or $AA^T = A^T A = I_n$

The correct answer is:
orthogonal

Find the trace of the following matrix

$$\begin{pmatrix} 14 & 15 \\ 2 & -5 \\ 5 & 10 \end{pmatrix}$$

- a. 10
- b. 16
- c. 9
- d. not possible to calculate
- e. 17

Your answer is incorrect.
The matrix A is of type $(3, 2) \Rightarrow A$ is not a square matrix $\Rightarrow \nexists tr(A)$.

The correct answer is:
not possible to calculate

Find the number of solutions of the following pair of linear equations: $4x - 6y = 10$ and $-8x + 12y = 10$.

a. infinite

b. 0

c. 1

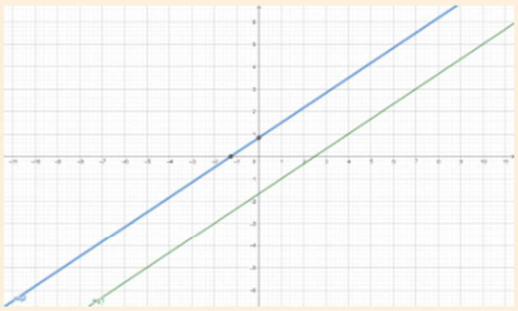
d. 2

Your answer is incorrect.

Solution 1.

The equations represent the equations of two straight lines. The intersection of these straight lines represents the solution to the problem.

In our case, we can observe that the straight lines are parallel ⇒ the problem has no solution.



Solution 2.

We solve the system:

$$\begin{cases} 4x - 6y = 10 \\ -8x + 12y = 10 \end{cases} | : (-2) \Leftrightarrow \begin{cases} 4x - 6y = 10 \\ 4x - 6y = -5 \end{cases} \Leftrightarrow 10 = -5, \text{ false}$$

Solution 3.

We write the equation in matrix form:

$$\begin{pmatrix} 4 & -6 \\ -8 & 12 \end{pmatrix} \cdot \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 10 \\ 10 \end{pmatrix}$$

Matrix A has proportional lines.

The

$$\overline{A} = (A|b) = \begin{pmatrix} 4 & -6 & 10 \\ -8 & 12 & 10 \end{pmatrix}$$

has no proportional lines ⇒ $A \cdot \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 10 \\ 10 \end{pmatrix}$ has no solution.

The correct answer is:
0

The pair of equation $3x - 5y = 7$ and $-6x + 10y = 7$ have

- a. a unique solution
- b. no solution
- c. infinitely many solutions
- d. two solutions

Your answer is incorrect.
We have

$$A = \begin{pmatrix} 3 & -5 \\ -6 & 10 \end{pmatrix}, \overline{A} = \begin{pmatrix} 3 & -5 & 7 \\ -6 & 10 & 7 \end{pmatrix}$$

Matrix A has proportional lines: $\frac{3}{-6} = \frac{-5}{10}$

Matrix $\overline{A}$ has no proportional lines: $\frac{3}{-6} = \frac{-5}{10} = \frac{7}{7} \Rightarrow$ the system has no solution.

The correct answer is:
no solution

Does the table below represent a linear function? If so, find a linear equation that models the data:

x	-6	0	2	4
g(x)	14	32	38	44

The points determine a linear function and $g(x) = 3x + 32$.

We check if the 4 points in the table define straight lines that have the same slope (if we get the same slope, then the points are collinear, therefore they define a linear function). The slope is used to measure the inclination of a straight line regarding the abscissa axis (the x-axis).

If we have been given two points through which the straight line goes through, we can use the following formula:

$$m = \frac{y_1 - y_2}{x_1 - x_2}$$

In our case:

$$m_1 = \frac{g(-6) - g(0)}{-6 - 0} = \frac{14 - 32}{-6} = 3$$

$$m_2 = \frac{g(2) - g(4)}{2 - 4} = \frac{38 - 44}{-2} = 3$$

$$m_3 = \frac{g(-6) - g(2)}{-6 - 2} = \frac{14 - 38}{-8} = 3$$

$$m_4 = \frac{g(0) - g(4)}{0 - 4} = \frac{32 - 44}{-4} = 3$$

In conclusion the points determine a linear function.

$$\begin{cases} g(x) = m_1 x + b = 3x + b \\ g(0) = 32 \Rightarrow b = 32 \end{cases} \Rightarrow g(x) = 3x + 32$$

Graph the linear function $f(x) = -x + 6$.

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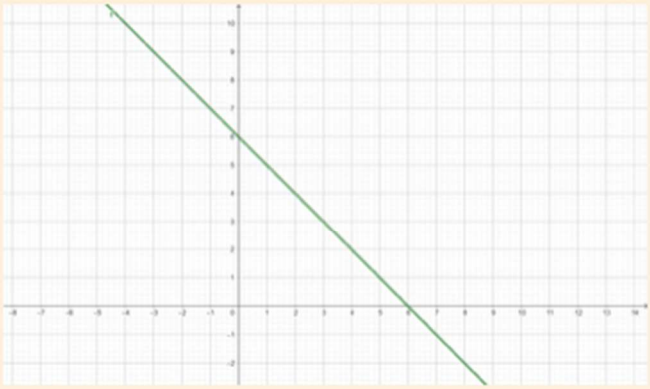
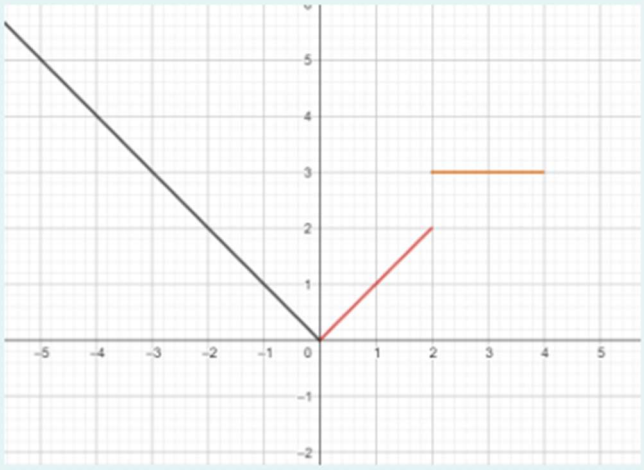


$G_f \cap Ox : y = 0, x = 6 \Rightarrow A(6,0)$

$G_f \cap Oy : x = 0, y = f(0) = 6 \Rightarrow B(0,6)$

Using the pictured graph, what is $f(2)$?



- a. -2
- b. 0
- c. 3
- d. 2

Your answer is incorrect.
If the answer is wrong: We represent a function as, $y = f(x)$ where x is the input value and for each x we get an output value as y. In our case, we can see from the graph that for $x = 2$, the value of $y = 2$, so $f(2) = 2$.

The correct answer is:
2

Find $f(1)$ when $f(x) = \frac{x^2-6}{x-3}$

- a. 1.5
- b. 2
- c. 2.5
- d. 3

Your answer is incorrect.
Replace the x in the function with the input value -2. We obtain,
$f(1) = \frac{1^2-6}{1-3} = \frac{-5}{-2} = 2.5.$

The correct answer is:
2.5

Determine whether the following function is increasing or decreasing, \(f(x)=-2x+5\).

- a. increasing
- b. decreasing

Your answer is incorrect.
A function $f : A \to B$ is increasing (decreasing) if for $x, y \in A, x \leq y$, we have $f(x) \leq f(y)$ $(f(x) \geq f(y))$.
The correct answer is:
decreasing

Determine whether the lines given by the equations below are: $y = \frac{3}{4}x - 9$, $-4x - 3y = 8$.

- a. parallel
- b. perpendicular
- c. neither parallel nor perpendicular

Your answer is incorrect.
Function $f : A \to B, A \subset \mathbb{R}, f(x) = ax + b$ has the slope equal by a.
Two straight lines **are parallel** if they have the same slope.
Two straight lines **are perpendicular** if the product of the slopes is -1.
$y = \frac{3}{4}x - 9 \Rightarrow m_1=\frac{3}{4}$ $-4x - 3y = 8 \Rightarrow y = -\frac{4}{3}x - \frac{8}{3} \Rightarrow m_2=\frac{4}{3}$.
We obtain that $m_1 \neq m_2 \Rightarrow$ the straight lines are not parallel, $m_1 \cdot m_2 = -1 \Rightarrow$ the straight lines are perpendicular.
The correct answer is:
perpendicular

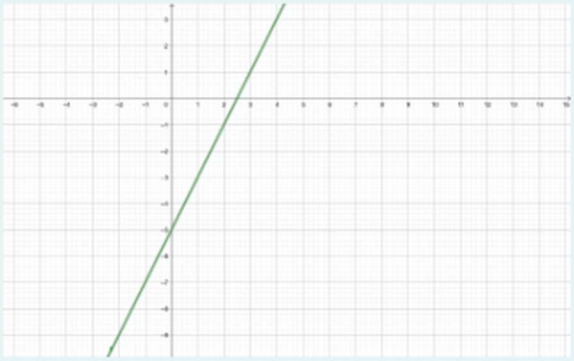
Identify the slope (m) and y-intercept (b) in the following linear function: $y = -3x - 7$.

- a. m = -3, b = -7
- b. m = -7, b = -3
- c. m = -3, b = 7
- d. m = 3, b = 7

Your answer is incorrect.
If we know the equation of the straight line, $y = mx + b$, the slope value will be m.

The correct answer is:
m = -3, b = -7

Identify the equation for the linear function represented by the graph:



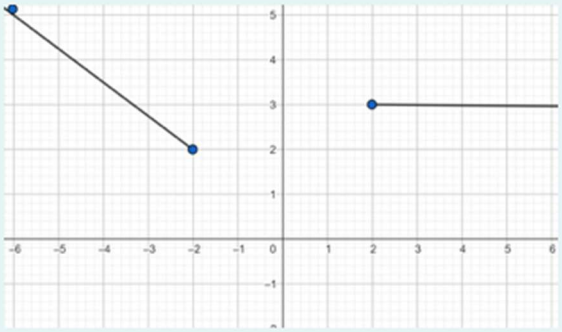
- a. y = 2x - 5
- b. y = 5x - 2
- c. y = 2x + 5
- d. y = 5x + 2

Your answer is incorrect.
Form the graph of the function $f(x) = ax + b, x \in \mathbb{R}$ we can observe the following points: $(0, -5)$ and $(2, -1)$. We have:

$$\begin{cases} f(0) = b = -5 \\ f(2) = 2a + b = -1 \end{cases} \Rightarrow \begin{cases} b = -5 \\ a = 2 \end{cases} \Rightarrow f(x) = 2x - 5$$

The correct answer is:
y = 2x - 5

Over what interval is this function constant?



a. $(-\infty, 2)$

b. $(-\infty, 2]$

c. $[2, \infty)$

d. $(2, \infty)$

Your answer is incorrect.
If the answer is wrong: A constant function is a function having the same range for different values of the domain. Graphically a constant function is a straight line, which is parallel to the x-axis. In our case, $f(x) = 3$, for $x \geq 2$. So, $x \in [2, \infty)$.

The correct answer is:
$[2, \infty)$

If $f(x) = -2x - 5$ and $g(x) = x^2 + 1$, find $f(g(x))$.

a. $-2x^2 - 7$

b. $-2x^2 + 3$

c. $4x^2 + 20x + 26$

d. $4x^2 + 26$

e. $-2x^2 - 5$

Your answer is incorrect.
If $f : A \to B$ and $g : C \to D, B \subseteq C$ then we can define the function $g \circ f : A \to D$, $(g \circ f)(x) = g(f(x))$.

$f(g(x)) = -2g(x) - 5 = -2x^2 - 7$

The correct answer is:
$-2x^2 - 7$

What is the domain of the function $y = \frac{x^2}{x^2-25}$?

- a. $(-\infty, -5) \cup (-5, \infty)$
- b. $(-\infty, 5) \cup (5, \infty)$
- c. $(-\infty, -5] \cup [-5, 5] \cup [5, \infty)$
- d. $(-\infty, -5) \cup (-5, 5) \cup (5, \infty)$

Your answer is incorrect.

The general form of a rational function is $f(x) = \frac{p(x)}{q(x)}$, where $p(x)$ and $q(x)$ are polynomials and $q(x) \neq 0$. Condition:
$x^2 - 25 \neq 0 \Leftrightarrow (x-5)(x+5) \neq 0 \Rightarrow x \neq -5, x \neq 5$

The correct answer is:
$(-\infty, -5) \cup (-5, 5) \cup (5, \infty)$

What is the domain of the function $y = -2 + \sqrt{2x-6}$?

- a. $[3, \infty)$
- b. $(-\infty, 3] \cup [3, \infty)$
- c. $(-\infty, -3) \cup (-3, \infty)$
- d. $(-\infty, -3] \cup [-3, \infty)$

Your answer is incorrect.
The n^{th} root function ($\sqrt[n]{}$) is defined:

i) \(\ f:[0,\infty)\rightarrow \mathbb{R}, $f(x) = \sqrt[n]{x}$ if n is even;

ii) $f : \mathbb{R} \to \mathbb{R}, f(x) = \sqrt[n]{x}$ if n is odd.

Condition: $2x - 6 \geq 0 \Leftrightarrow 2x \geq 6 \Leftrightarrow x \geq 3$. So, $x \in [3, \infty)$

The correct answer is:
$[3, \infty)$

Is this an even, odd, or neither function $f(x) = 7x^8 - 9x^2 + 33$

Select one:

- a. even function
- b. odd function
- c. neither
- d. not a function

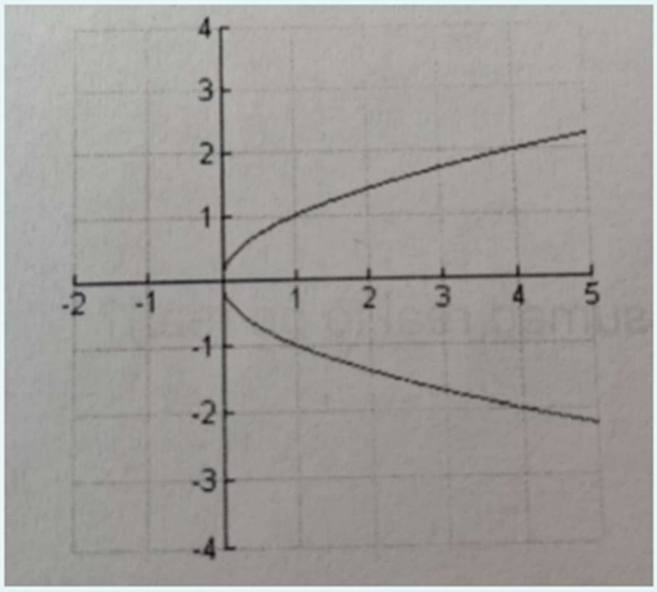
Your answer is incorrect.
A set $D \subset \mathbb{R}$ is symmetric about the origin if $\forall x \in D$ we have $-x \in D$.

Let D be a symmetric set, the function $f : D \to \mathbb{R}$ is even (odd) if $f(-x) = f(x)$ $(f(-x) = -f(x)), \forall x \in D$.

$f(-x) = 7(-x)^8 - 9(-x)^2 + 33 = 7x^8 - 9x^2 + 33 = f(x)$

The correct answer is:
even function

Is the graph an even, odd, or neither function?

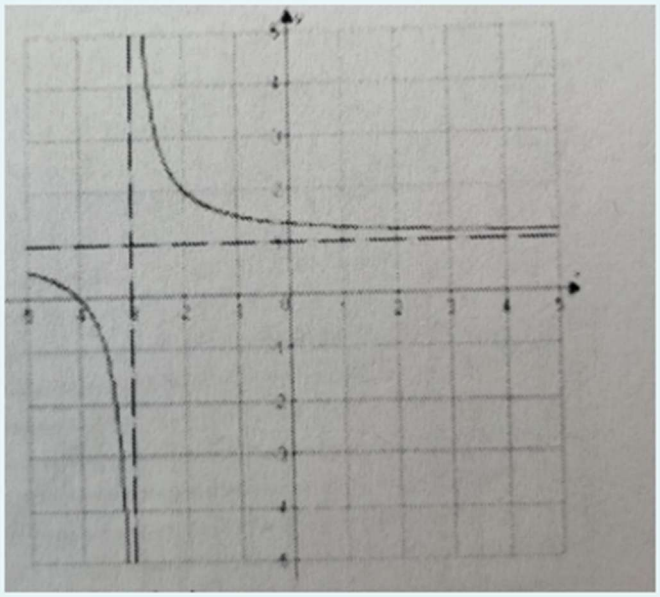


- a. even
- b. odd
- c. neither
- d. both

Your answer is incorrect.
From the graph we can observe that from $x = y^2$, we have $y = \sqrt{x}$ or $y = -\sqrt{x}, x \geq 0$. The functions $f(x) = \sqrt{x}$ and $g(x) = -\sqrt{x}$ they are neither even nor odd function.

The correct answer is:
neither

Is the graph even, odd, or neither?



- a. even function
- b. odd function
- c. neither
- d. not a function

Your answer is incorrect.
A set $D \subset \mathbb{R}$ is symmetric about the origin if $\forall x \in D$ we have $-x \in D$.

Let D be a symmetric set, if $f : D \to \mathbb{R}$ is an even function, then G_f has the axis of symmetry $y = 0$ or the Ox axis.

Let D be a symmetric set, if function $f : D \to \mathbb{R}$, is an odd function, then G_f is symmetric to the point $O(0, 0)$.

The correct answer is:
neither

Evaluate $f(x) = -3x^2 + 2x$ for $f(-2)$.

- a. 10
- b. -8
- c. 12
- d. -16

Your answer is incorrect.
Replace the x in the function with the input value -2. We obtain,
$f(-2) = -3(-2)^2 + 2(-2) = -12 - 4 = -16.$

The correct answer is:
-16

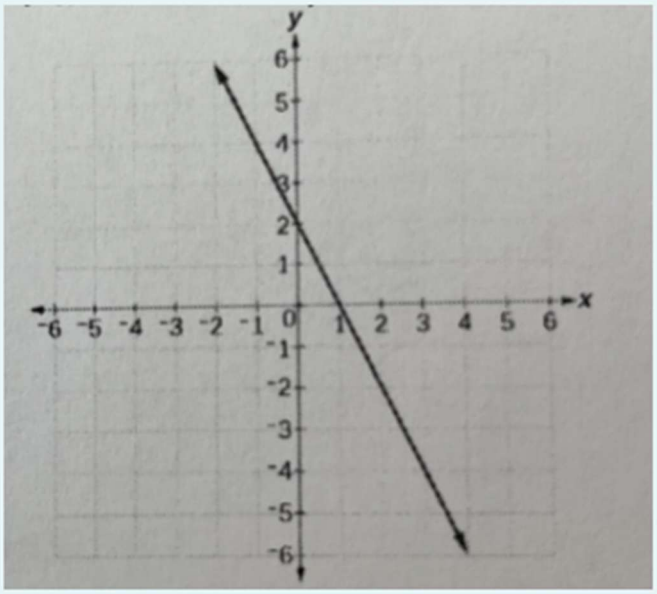
Tidy STACK question tool | Question is missing tests or variants.

Given the following set of information, find a linear equation satisfying the conditions, if possible: Passes through $(5, 1)$ and $(3, -9)$.

A correct answer is $y = 5 \cdot x - 24$, which can be typed in as follows: y = 5*x-24

Tidy STACK question tool | Question is missing tests or variants.

Find the slope of the line in the graph below:



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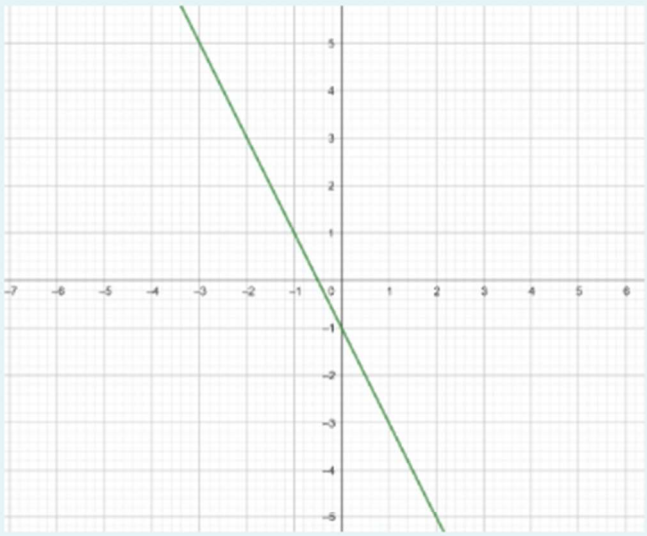
Write an equation for line in the graph below:



A correct answer is $y = -2 \cdot x - 1$, which can be typed in as follows: `y = -(2*x)-1`

Determine whether the following relation is a function $\{(2, 1), (3, 2), (-1, 1), (0, 2)\}$

Select one:

- True
- False

The correct answer is 'True'.

Question 1

Incorrect

Mark 0.00 out of 1.00

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Edit question

Tidy STACK question tool | Question is missing tests or variants.

Let $(s_n) = \left\{ \frac{P_k(n)}{Q_i(n)}, n \in \mathbb{N} \right\}$ be a sequence such that $P_k(n)$ and $Q_i(n)$ are two polynomials of degree $k \leq 3$ and $i \leq 3$ respectively.

Give an example of sequence (s_n) such that the sequence is

a) divergent; 0

Your last answer was interpreted as follows:

$$0$$

Incorrect answer.

Consider the sequence (s_n), $s_n = \frac{a_k n^k + a_{k-1} n^{k-1} + \ldots + a_1 n + a_0}{b_i n^i + b_{i-1} n^{i-1} + \ldots + b_1 n + b_0}$.

The relationship between k and i is decisive. Use it!

b) convergent to zero; 0

Your last answer was interpreted as follows:

$$0$$

Incorrect answer.

Consider the sequence (s_n), $s_n = \frac{a_k n^k + a_{k-1} n^{k-1} + \ldots + a_1 n + a_0}{b_i n^i + b_{i-1} n^{i-1} + \ldots + b_1 n + b_0}$.

The relationship between k and i is decisive. Use it!

Use GeoGebra to visualize your example before you answer the question.

Question 2

Incorrect

Mark 0.00 out of 1.00

Flag question

Edit question

Tidy STACK question tool | Question is missing tests or variants.

If in the previous exercise your answer was correct, please try this time to give new examples that significantly different from your previous examples.

If in the previous exercise your answer was wrong, use the feedback and try to give new examples that are correct.

Let $(s_n) = \left\{ \frac{P_k(n)}{Q_i(n)}, n \in \mathbb{N} \right\}$ be a sequence such that $P_k(n)$ and $Q_i(n)$ are two polynomials of degree $k \leq 3$ and $i \leq 3$ respectively.

Give an example of sequence (s_n) such that the sequence is

a) divergent; 0

Your last answer was interpreted as follows:

$$0$$

Incorrect answer.

Consider the sequence $(s_n), s_n = \frac{a_k n^k + a_{k-1} n^{k-1} + \ldots + a_1 n + a_0}{b_i n^i + b_{i-1} n^{i-1} + \ldots + b_i n + b_0}$.

(s_n) is divergent if $k > i$.

For example: $(s_n), s_n = \frac{-2n^3+5n+1}{n^2-4}, n \in \mathbb{N}$ is divergent, $\lim_{n\to\infty} s_n = -\infty$.

b) convergent to zero; 0

Your last answer was interpreted as follows:

$$0$$

Incorrect answer.

Consider the sequence $(s_n), s_n = \frac{a_k n^k + a_{k-1} n^{k-1} + \ldots + a_1 n + a_0}{b_i n^i + b_{i-1} n^{i-1} + \ldots + b_i n + b_0}$.

(s_n) is convergent to 0 if $k < i$.

For example: $(s_n), s_n = \frac{-2n^2+5n+1}{n^3-27}, n \in \mathbb{N}$ is convergent, $\lim_{n\to\infty} s_n = 0$.

Use GeoGebra to visualize your example before you answer the question.

Question 3

Incorrect

Mark 0.00 out of 1.00

Flag question

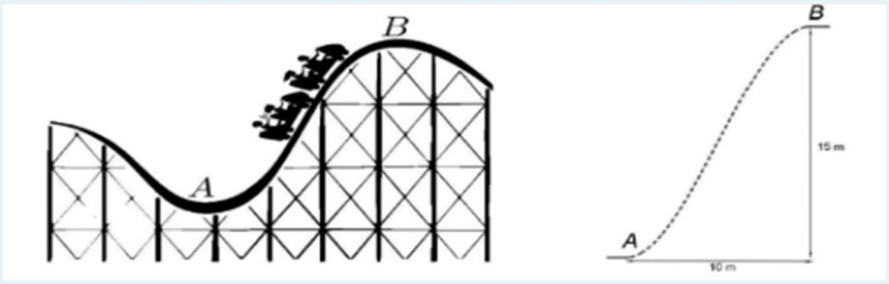
Edit question

Tidy STACK question tool | Question is missing tests or variants.

Parts of a structure in a roller coaster need to be replaced. It is the part between points A and B (see figures below) that needs to be replaced. Your task is to determine a trigonometric function that can be used during construction so that there is a smooth transition in points A and B.

Use the measurements in the sketch to the right below.

Use GeoGebra to check if your suggested function formula is suitable before you give your answer.

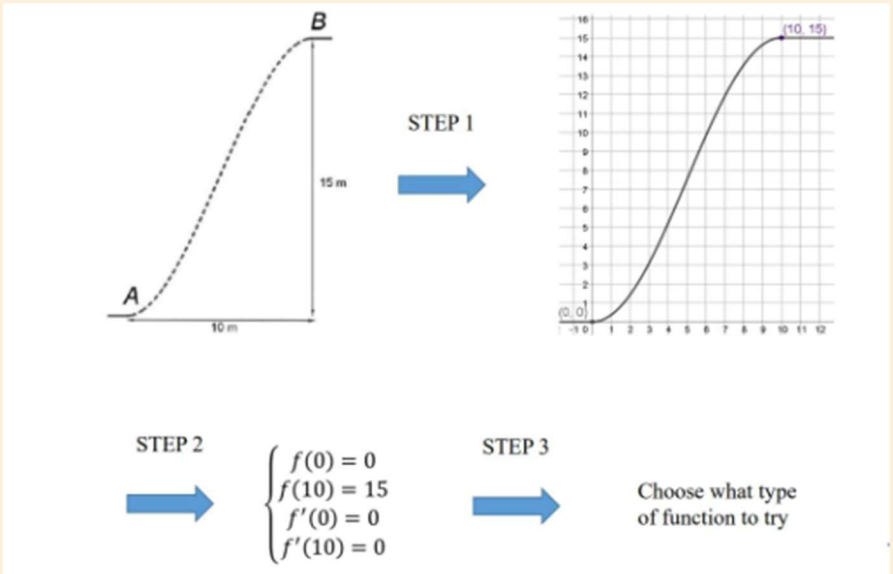


$f(x) =$ 0

Your last answer was interpreted as follows:

0

✖ Incorrect answer.



Question 4

Incorrect

Mark 0.00 out of 1.00

Flag question

Edit question

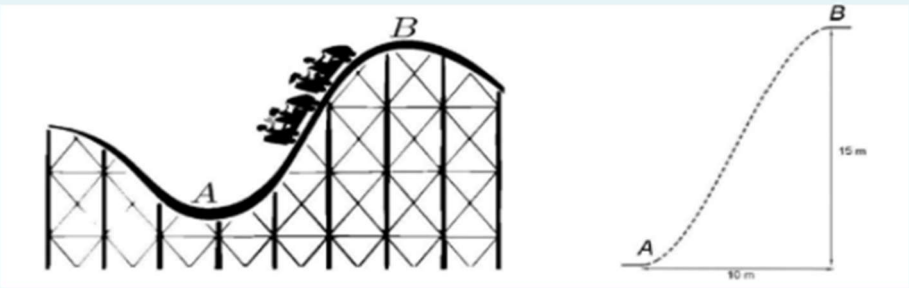
Tidy STACK question tool | Question is missing tests or variants.

If in the previous exercise your answer was correct, please try this time to give a new example. If in the previous exercise your answer was wrong, use the feedback and try to give a new example.

Parts of a structure in a roller coaster need to be replaced. It is the part between points A and B (see figures below) that needs to be replaced. Your task is to determine a trigonometric function that can be used during construction so that there is a smooth transition in points A and B.

Use the measurements in the sketch to the right below.

Use GeoGebra to check if your suggested function formula is suitable before you give your answer.

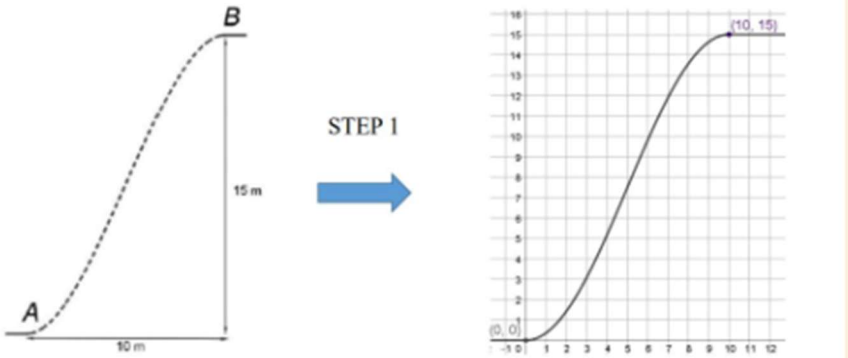


$f(x) =$ 0

Your last answer was interpreted as follows:

$$0$$

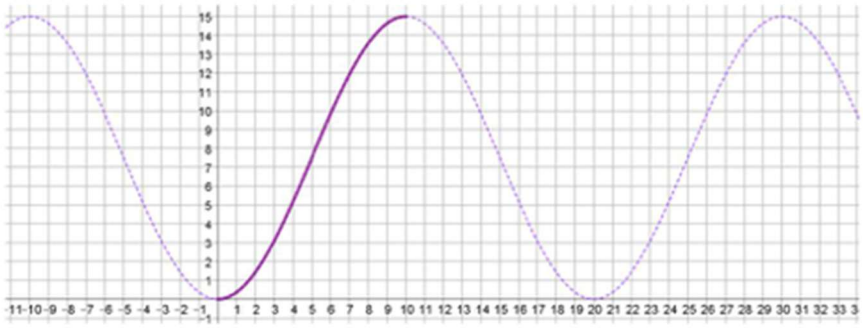
✖ Incorrect answer.



STEP 2 → $\begin{cases} f(0) = 0 \\ f(10) = 15 \\ f'(0) = 0 \\ f'(10) = 0 \end{cases}$ → STEP 3 → Choose what type of function to try

Try a trigonometric function

$f(x) = A \sin \beta(x + \alpha) + \gamma$



$A = \frac{15}{2}$

$\alpha = -\frac{10}{2}$

$\gamma = \frac{15}{2}$

$\beta \cdot 10 = \pi \Leftrightarrow \beta = \frac{\pi}{10}$

→

$f(x) = \frac{15}{2} \sin \frac{\pi}{10}\left(x - \frac{10}{2}\right) + \frac{15}{2}$

$f(x) = 7{,}5 \sin(0{,}1\pi(x - 5)) + 7{,}5$

$0 \leq x \leq 10$

Question 5

Incorrect

Mark 0.00 out of 1.00

Flag question

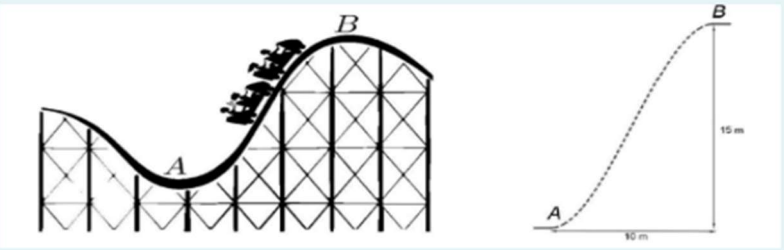
Edit question

Tidy STACK question tool | Question is missing tests or variants.

Parts of a structure in a roller coaster need to be replaced. It is the part between points A and B (see figures below) that needs to be replaced. Your task is to determine a polynomial function that can be used during construction so that there is a smooth transition in points A and B.

Use the measurements in the sketch to the right below.

Use GeoGebra to check if your suggested function formula is suitable before you give your answer.

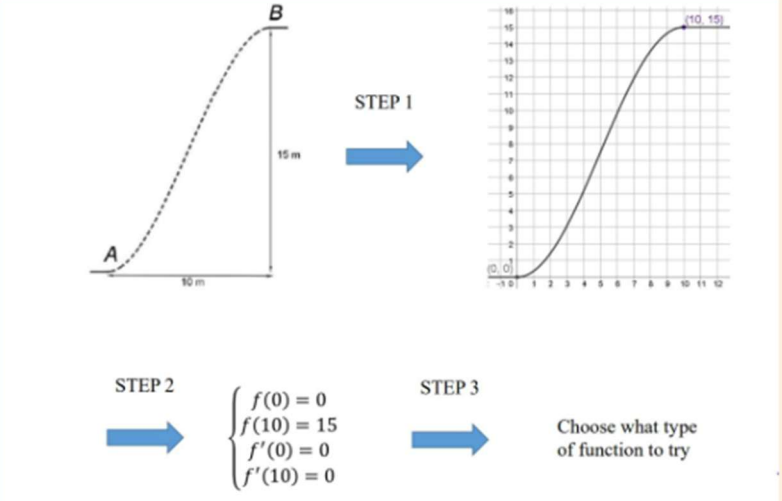


$f(x) =$ 0

Your last answer was interpreted as follows:

$$0$$

✖ Incorrect answer.



Question 6

Incorrect

Mark 0.00 out of 1.00

Flag question

Edit question

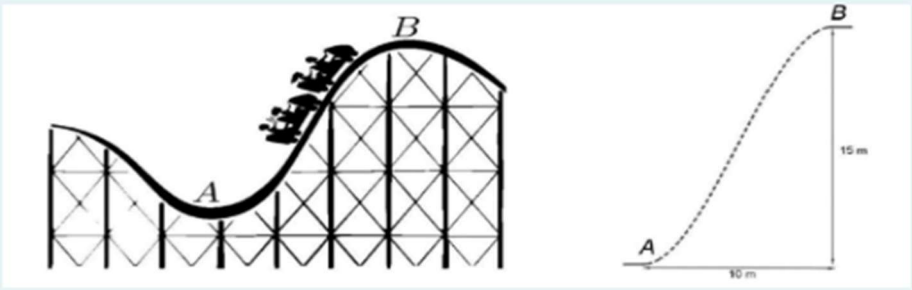
Tidy STACK question tool | Question is missing tests or variants.

If in the previous exercise your answer was correct, please go to exercise no. 7. If in the previous exercise your answer was wrong, use the feedback and try to give new examples.

Parts of a structure in a roller coaster need to be replaced. It is the part between points A and B (see figures below) that needs to be replaced. Your task is to determine a polynomial function that can be used during construction so that there is a smooth transition in points A and B.

Use the measurements in the sketch to the right below.

Use GeoGebra to check if your suggested function formula is suitable before you give your answer.

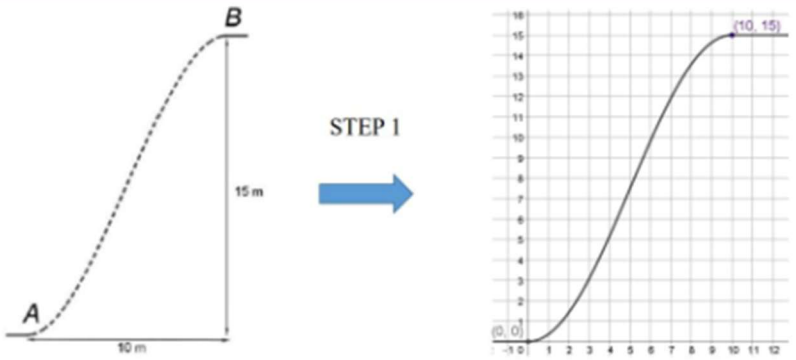


$f(x) =$ 0

Your last answer was interpreted as follows:

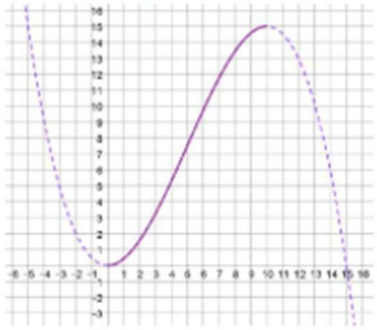
$$0$$

✖ Incorrect answer.



STEP 2 → $\begin{cases} f(0) = 0 \\ f(10) = 15 \\ f'(0) = 0 \\ f'(10) = 0 \end{cases}$ STEP 3 → Choose what type of function to try

Try a polynomial function



$$f'(x) = \alpha x(x-10) = \alpha(x^2 - 10x)$$

$$f(x) = \alpha\left(\frac{x^3}{3} - \frac{10x^2}{2}\right) + \beta$$

$$f(0) = 0 \Rightarrow \beta = 0$$

$$f(x) = \alpha\left(\frac{x^3}{3} - \frac{10x^2}{2}\right)$$

$$f(10) = 15 \Rightarrow \alpha\left(\frac{10^3}{3} - \frac{10 \cdot 10^2}{2}\right) = 15$$

$$\alpha = -\frac{15 \cdot 6}{10^3}$$

$$f(x) = -\frac{15 \cdot 6}{10^3}\left(\frac{x^3}{3} - \frac{10x^2}{2}\right) = \frac{15x^2(30-2x)}{10^3}$$

$$f(x) = \frac{3x^2(15-x)}{100}$$

Question 7

Incorrect

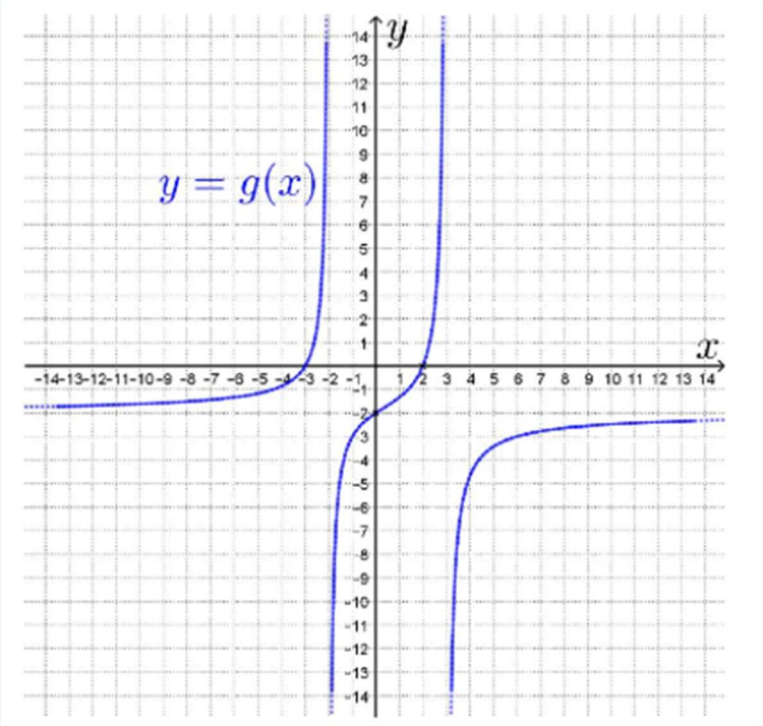
Mark 0.00 out of 1.00

Flag question

Edit question

Tidy STACK question tool | Question is missing tests or variants.

The figure above shows the graph of the function g.



Use the graph determine the functional formula for $g(x)$.

Use GeoGebra to check if your suggested function formula is suitable before you give your answer.

$g(x)$ = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

Reading from the sketch gives:

- two vertical asymptotes $x = -2$ and $x = 3$, as well as

- a horizontal asymptotes $y = -2$.

Use this information to construct your answer in the next exercise and check it in GeoGebra before you give the answer.

Question 8

Incorrect

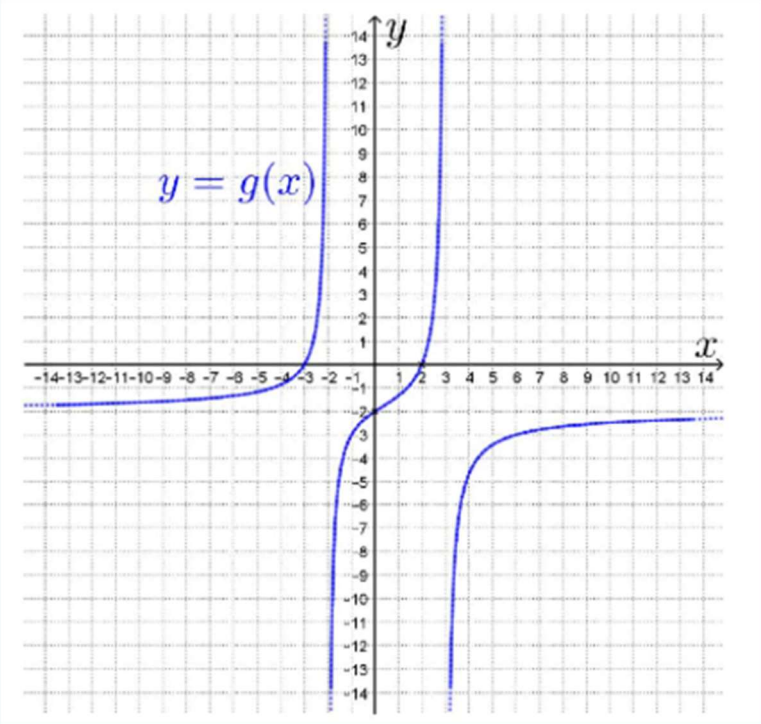
Mark 0.00 out of 1.00

Flag question

Edit question

Tidy STACK question tool | Question is missing tests or variants.

The figure above shows the graph of the function g.



Use the graph determine the functional formula for $g(x)$.

Use GeoGebra to check if your suggested function formula is suitable before you give your answer.

$g(x)$ = 0

Your last answer was interpreted as follows:

$$0$$

✖ **Incorrect answer.**

Reading from the sketch gives:

- two vertical asymptotes $x = -2$ and $x = 3$, as well as

- a horizontal asymptotes $y = -2$.

One way to form the desired rational function g is to start with $g(x) = \frac{p(x)}{(x-(-2))(x-3)}$, where $p(x) = -2x^2 + bx + c$, $b, c \in \mathbb{R}$. Some selected points on the graph, e.g. $(0, -2)$ and $(2, 0)$ are used to determine the values of b and c.

Overall, we get $g(x) = \frac{-2x^2-2x+12}{(x+2)(x-3)}$.

Question 1

Incorrect

Mark 0.00 out of 1.00

Flag question

Edit question

Let $f : \mathbb{R} \to \mathbb{R}$,

$$f(x) = \begin{cases} e^x + 2mx + 1, & x \geq 0 \\ 2 - x, & x < 0 \end{cases}$$

Determine $m \in \mathbb{R}$ such that f is derivable on $\mathbb{R}$.

a. m=4

b. m=-1

c. m=0 ✖

d. m=1

Your answer is incorrect.

For derivability at the point 0, we have the condition:

$$\lim_{\substack{x \to 0 \\ x<0}} \frac{f(x)-f(0)}{x-0} = \lim_{\substack{x \to 0 \\ x>0}} \frac{f(x)-f(0)}{x-0} = \lim_{x \to 0} \frac{f(x)-f(0)}{x-0}$$

Try to use this condition in the next exercise to give the correct answer.

Use GeoGebra for visualisation.

Question 2

Incorrect

Mark 0.00 out of 1.00

Flag question

Edit question

If in the previous exercise your answer was correct, please go to the exercise no. 3.

If in the previous exercise your answer was wrong, use the feedback and try to give a correct answer to the following:

Let $f : \mathbb{R} \to \mathbb{R}$,

$$f(x) = \begin{cases} e^x + 2mx + 1, & x \geq 0 \\ 2 - x, & x < 0 \end{cases}$$

Determine $m \in \mathbb{R}$ such that f is derivable on $\mathbb{R}$.

a. m=-1

b. m=4

c. m=0 ✖

d. m=1

Your answer is incorrect.

For derivability at the point 0, we have the condition:

$$\lim_{\substack{x\to 0\\ x<0}} \frac{f(x)-f(0)}{x-0} = \lim_{\substack{x\to 0\\ x>0}} \frac{f(x)-f(0)}{x-0} = \lim_{x\to 0} \frac{f(x)-f(0)}{x-0}$$

$$\lim_{\substack{x\to 0\\ x<0}} \frac{f(x)-f(0)}{x-0} = \lim_{\substack{x\to 0\\ x<0}} \frac{2-x-2}{x} = -1$$

$$\lim_{\substack{x\to 0\\ x>0}} \frac{f(x)-f(0)}{x-0} = \lim_{\substack{x\to 0\\ x>0}} \frac{e^x+2mx+1-2}{x} = \lim_{\substack{x\to 0\\ x>0}} \left(\frac{e^x-1}{x} + 2m\right) = 2m+1$$

$$\lim_{x\to 0} \frac{f(x)-f(0)}{x-0} = \lim_{x\to 0} \frac{e^x+2mx+1-2}{x} = 2m+1$$

Condition: $2m + 1 = -1 \Rightarrow m = -1$.

Use GeoGebra for visualisation.

Question 3

Incorrect

Mark 0.00 out of 1.00

Flag question

Edit question

Find the derivative of the function $f : \mathbb{R} \to \mathbb{R}, f(x) = \sqrt{1 - \cos x}$ in the point $x_0 = 0$

.

a. $\frac{\sqrt{2}}{2}$

b. does not exist

c. -1

d. $-\frac{\sqrt{2}}{2}$

e. 0 ✖

f. 1

Your answer is incorrect.
Try to apply in the next exercise the definition of the derivative and check its existence:

$f'(0) = \lim_{x \to 0} \frac{f(x) - f(0)}{x}$

Use GeoGebra for visualisation.

Question 4

Incorrect

Mark 0.00 out of 1.00

Flag question

Edit question

If in the previous exercise your answer was correct, please go to the exercise no. 5.

If in the previous exercise your answer was wrong, use the feedback and try to give a correct answer to the following:

Find the derivative of the function $f : \mathbb{R} \to \mathbb{R}$, $f(x) = \sqrt{1 - \cos x}$ in the point $x_0 = 0$.

a. 0 ✖

b. -1

c. $-\frac{\sqrt{2}}{2}$

d. 1

e. does not exist

f. $\frac{\sqrt{2}}{2}$

Your answer is incorrect.

We apply the definition of the derivative,

$$f'(0) = \lim_{x\to 0} \frac{f(x)-f(0)}{x} = \lim_{x\to 0} \frac{\sqrt{1-\cos x}-0}{x} =$$

$$= \lim_{x\to 0} \frac{\sqrt{1-\left(1-2\sin^2\frac{x}{2}\right)}}{x} = \lim_{x\to 0} \frac{\sqrt{2}\left|\sin\frac{x}{2}\right|}{x}$$

$$\lim_{\substack{x\to 0\\ x<0}} \frac{\sqrt{2}\left|\sin\frac{x}{2}\right|}{x} = \lim_{\substack{x\to 0\\ x<0}} \frac{-\sqrt{2}\sin\frac{x}{2}}{\frac{x}{2}\cdot 2} = -\frac{\sqrt{2}}{2}$$

$$\lim_{\substack{x\to 0\\ x>0}} \frac{\sqrt{2}\left|\sin\frac{x}{2}\right|}{x} = \lim_{\substack{x\to 0\\ x>0}} \frac{\sqrt{2}\sin\frac{x}{2}}{\frac{x}{2}\cdot 2} = \frac{\sqrt{2}}{2}$$

In conclusion, $f'(0)$ does not exist.

Use GeoGebra for visualisation.

Question 5

Incorrect

Mark 0.00 out of 1.00

Flag question

Edit question

Determine $m \in \mathbb{R}$ such that $f : \mathbb{R} \to \mathbb{R}$, $f(x) = mx^3 - 2x^2 + x - 1$ is strictly increasing on $\mathbb{R}$.

a. $m \in \emptyset$ ✖

b. $m \in \mathbb{R}$

c. $m \leq 1$

d. $m > \frac{4}{3}$

Your answer is incorrect.
If the function f is derivable on $\mathbb{R}$ and $f'(x) > 0, \forall x \in \mathbb{R}$ then f is strictly increasing on $\mathbb{R}$.

Use GeoGebra for visualisation.

Question 6

Incorrect

Mark 0.00 out of 1.00

Flag question

Edit question

Determine $m \in \mathbb{R}$ such that $f : \mathbb{R} \to \mathbb{R}$, $f(x) = mx^3 - 2x^2 + x - 1$ is strictly increasing on $\mathbb{R}$.

a. $m > \frac{4}{3}$

b. $m \in \emptyset$ ✖

c. $m \in \mathbb{R}$

d. $m \leq 1$

Your answer is incorrect.
If the function f is derivable on $\mathbb{R}$ and $f'(x) > 0, \forall x \in \mathbb{R}$ then f is strictly increasing on $\mathbb{R}$. In our case,

$f'(x) = 3mx^2 - 4x + 1$

$3mx^2 - 4x + 1 > 0, \forall x \in \mathbb{R}$

Conditions:

$$\begin{cases} 3 & > 0 \\ \Delta = 16 - 12m & < 0 \end{cases}$$

$\Rightarrow m > \frac{4}{3}$.

Use GeoGebra for visualisation.

3. STACK in Computer Science

Tidy STACK question tool | Question is missing tests or variants.

What values will the following program display?

```
int x = 7, y = 4, m = 2, n, p;
p = (++x) - m + (x--);
n = p - 4 + (--y);
m = x + y;
printf("\n%d %d %d", m, n, p++);
```

m = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

We will analyze the code line by line to determine the final values of the variables m, n, and p.

Initializing variables:

x = 7, y = 4, m = 2, n and p are declared but have no explicitly defined initial values.

Evaluation of expressions:

p = (++x) - m + (x--):

++x increments x before evaluating the expression, so x becomes 8 and p gets the value 8.

m is 2, so p becomes 8 - 2 + 8 = 14.

Then x-- decrements x after evaluating the expression, so x becomes 7.

n = p - 4 + (--y):

p is 14 from the previous evaluation.

--y decrements y before evaluating the expression so that y becomes 3.

n becomes 14 - 4 + 3 = 13.

m = x + y:

x is now 7 and y is 3, so m becomes 7 + 3 = 10.

printf("\n%d %d %d", m, n, p++):

m, n, and p are displayed, but p++ is used for display, meaning that the value of p is displayed, then incremented.

Thus, the displayed values are 10, 13, and 14, in that order.

Updating variable p after display:

p is now incremented after display and becomes 15, in the subsequent case of using the value of the variable p, it will contain 15.

n = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

We will analyze the code line by line to determine the final values of the variables m, n, and p.

Initializing variables:

x = 7, y = 4, m = 2, n and p are declared but have no explicitly defined initial values.

Evaluation of expressions:

p = (++x) - m + (x--):

++x increments x before evaluating the expression, so x becomes 8 and p gets the value 8.

m is 2, so p becomes 8 - 2 + 8 = 14.

Then x-- decrements x after evaluating the expression, so x becomes 7.

n = p - 4 + (--y):

p is 14 from the previous evaluation.

--y decrements y before evaluating the expression so that y becomes 3.

n becomes 14 - 4 + 3 = 13.

m = x + y:

x is now 7 and y is 3, so m becomes 7 + 3 = 10.

printf("\n%d %d %d", m, n, p++):

m, n, and p are displayed, but p++ is used for display, meaning that the value of p is displayed, then incremented.

Thus, the displayed values are 10, 13, and 14, in that order.

Updating variable p after display:

p is now incremented after display and becomes 15, in the subsequent case of using the value of the variable p, it will contain 15.

p = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

We will analyze the code line by line to determine the final values of the variables m, n, and p.

Initializing variables:

x = 7, y = 4, m = 2, n and p are declared but have no explicitly defined initial values.

Evaluation of expressions:

p = (++x) - m + (x--):

++x increments x before evaluating the expression, so x becomes 8 and p gets the value 8.

m is 2, so p becomes 8 - 2 + 8 = 14.

Then x-- decrements x after evaluating the expression, so x becomes 7.

n = p - 4 + (--y):

p is 14 from the previous evaluation.

--y decrements y before evaluating the expression so that y becomes 3.

n becomes 14 - 4 + 3 = 13.

m = x + y:

x is now 7 and y is 3, so m becomes 7 + 3 = 10.

printf("\n%d %d %d", m, n, p++):

m, n, and p are displayed, but p++ is used for display, meaning that the value of p is displayed, then incremented.

Thus, the displayed values are 10, 13, and 14, in that order.

Updating variable p after display:

p is now incremented after display and becomes 15, in the subsequent case of using the value of the variable p, it will contain 15.

A correct answer is 10, which can be typed in as follows: `10`

A correct answer is 13, which can be typed in as follows: `13`

A correct answer is 14, which can be typed in as follows: `14`

Tidy STACK question tool | Question is missing tests or variants.

The following code sequence is given:

```
int i, j = 0;
for (i = 1; i < 14; i += 3) {
    j++;
    if (i == 9) {
        break;
    }
}
printf("j=%d", j);
```

What will be the final value of j? 0

Your last answer was interpreted as follows:

$$0$$

✖ Incorrect answer.

In this code, the for loop iterates through the values of i starting at 1 and increasing by 3 each iteration, until i equals or exceeds the value 14. In each iteration, the variable j is incremented by 1.

However, inside the loop there is an if condition that checks if i is equal to 9. If this condition is met, the loop is broken using the break statement, and control is transferred to the printf statement.

If we analyze how the for loop behaves, we can see that i will take the values: 1, 4, 7, 10, 13. When i becomes 10, the condition i == 9 is false and the break statement is not executed. Therefore, the loop continues to iterate until i becomes 13.

So, j is incremented a total of 5 times, from its initial value of 0. Thus, at the end of the loop, j will have the value of 5.

The instruction printf("j=%d", j);, will display the value of j, and more precisely it will display j=5.

In this code, for is a loop that executes every time i is less than 14 and increments by 3 on each iteration. At each iteration, the variable j is incremented by 1.

The loop continues until i becomes 9. At this point, i == 9 is true, and the loop is terminated using break.

So the last value of i is 13 because it will never execute the if statement, and j is incremented by 5 times, resulting in a value of 5 for j.

Therefore, the displayed result will be "j=5".

Tidy STACK question tool | Question is missing tests or variants.

The following program is considered:

```
int main() {
    int a, b, c, d, i;
    scanf("%d %d", &a, &b);

    if (a > b) {
        c = a;
        a = b;
        b = c;
    }

    d = 0;
    for (i = a; i <= b; i++) {
        if (i % 2 == 0) {
            d++;
        }
    }

    printf("%d", d);
}
```

What value is displayed for a=33 and b=18?

3

Your last answer was interpreted as follows:

3

✖ Incorrect answer.

In this program, we will look at how variables and control structures behave within code.

Reading input data:

Using the scanf function, we read two integers a and b from the input.

Checking and exchanging values:

We use an if structure to check if a is greater than b.

If this condition is true, we reverse the values of a and b so that a is less than or equal to b.

Initializing the variable d and the for loop:

We initialize the variable d with 0.

We use a for loop to iterate from a to b, inclusive.

In each iteration, we check if the number is even using the modulo % operator.

Increasing d:

If the number is even, we increment the variable d.

Display the result:

Finally, we display the value of d, which is the number of even numbers between a and b.

For a = 33 and b = 18:

Since a is greater than b, their values will be reversed.

So a will become 18 and b will become 33.

Between 18 and 33 there are 8 even numbers: 20, 22, 24, 26, 28, 30, 32.

Therefore, the program will display 8.

Thus, the displayed value for a = 33 and b = 18 will be 8.

A correct answer is 8, which can be typed in as follows: 8

Specify the displayed values, if the numerical values 5 2 -3 are to be read in the indicated order:

```
int main() {
    int a, b;
    scanf("%d%d%d", &a, &b, &a);
    printf("%d,", a);
    printf("%d,", b);
    printf("%d", a + b);
}
```

- a. -3 2 -1
- b. 5 2 7
- c. 5 2 7
- d. there are syntax errors ✖

Your answer is incorrect.
In this code, a sequence of three integers is read using the scanf function, and then the values read and the sum of the first two numbers are displayed.
Function scanf("%d%d%d", &a, &b, &a); is used to read three integers. Since the variable a is read twice, the last value read to overwrite the previous value of the variable a.

Then the read values are displayed using the printf function. In this case, the a variable, the b variable, and the sum of the first two numbers (a + b) are displayed.

If we enter the values 5, 2 and -3 in this order, following the instructions in the code:

The first value read is 5 and is stored in the variable a.

The second value read is 2 and is stored in the variable b.

The third value read is -3 and is stored again in the a variable, overwriting the previous value.

Thus, the displayed values will be:

a: -3 (last value read for a)

b: 2

a + b: -1 (sum of initially read values for a and b: 5 + 2 = 7, but last read value for a was -3)

The correct answer is:
-3 2 -1

We consider the variables a, b, c, d and e. Write the correct version of the statements, so that the following assignments are not accompanied by conversions that modify the assigned values.

d=-3.452	float	✔
c='a'	int	✖
b=2.1	int	✖
a=3	int	✔

Your answer is partially correct.
In the C language, data types are used to specify the nature of the data stored in variables and how they are interpreted by the program. Here is a full explanation for each data type mentioned in the given problem:

The char data type is used to store characters and is represented by a single byte in memory. Char variables can store a single ASCII character or a special character. In our case, when we assign the value 'a' to the variable c, we store the ASCII code of the character 'a', which is 97. This ensures that the variable c will contain the ASCII value corresponding to the character 'a'.

The double data type is used to store double-precision floating-point real numbers. Variables of type double are represented on 8 bytes in memory and provide higher precision than single-precision floating-point data types. When we assign the value -3.452 to the variable d, we store this value with double precision in memory.

The int data type is used to store integers. Variables of type int are represented by 4 bytes in memory and can store integer values in the range specified by the data type. When we assign the value 3 to the variable a, we store this value as an integer in memory.

The float data type is used to store single-precision floating-point real numbers. Float variables are represented by 4 bytes in memory and provide lower precision than double data types, but take up less memory space. When we assign the value 2.1 to the variable b, we must add the suffix f to specify that the value is a float, like this: 2.1f.

By using the correct data types and appropriate values, we ensure accurate data storage in variables and avoid implicit conversions that could change assigned values or affect data precision.

You have correctly selected 2.
The correct answer is:
d=-3.452 → float,

c='a' → char,

b=2.1 → float,

a=3 → int

Tidy STACK question tool | Question is missing tests or variants.

Specify what will be displayed following the execution of the program sequence below for n=5 (s,n and k are integer variables).

```
s = 0, k = 1;
while (k <= n) {
    s += k;
    k += 2;
}
printf("s=%d", s);
```

s = 0

Your last answer was interpreted as follows:

$$0$$

✖ Incorrect answer.

In this program, we have a while loop that adds every second integer from 1 to n to the variable s. We will analyze what happens in each iteration of the loop and then determine the final value of the variable s.

Initializing variables:

s = 0: The variable s is initialized to the value 0.

k = 1: The variable k is initialized with the value 1.

Loop entry:

At each iteration, the value of k is added to the value of s.

Then k is incremented by 2 to move to the next odd integer.

Ending the loop:

The loop continues to execute until k becomes greater than n.

Since k is incremented by 2 each iteration, the loop will only include odd numbers up to and including n.

Display the result:

At the end of the loop execution, the variable s will contain the sum of all odd numbers from 1 to n.

Therefore, the value of s will be the sum of the odd numbers from 1 to 5.

For n = 5, the loop will add all the odd numbers from 1 to 5:

1 + 3 + 5 = 9

Thus, the value of the variable s will be 9. At the end, the program will display: s=9

Therefore, the value of s will be 9 for n = 5.

A correct answer is 9, which can be typed in as follows: 9

Tidy STACK question tool | Question is missing tests or variants.

Let the variable *n* be the value 3.14159665. What does the following instruction display:

```
printf("%.0f", n);
```

0

Your last answer was interpreted as follows:

$$0$$

✖ Incorrect answer.

Statement printf("%.0f", n); displays the value of variable n with 0 decimal places. If n has no decimal part, it will be rounded to the nearest whole number.

In our case, n has the value 3.14159665, and the format specifier %.0f indicates that we want to display the value of n without any decimals. So 3.14159665 will be displayed as 3.

So the statement printf("%.0f", n); will display 3.

The .0 specifier used to display the value of the variable without decimals, but it does not mean that it will remove the decimals from memory, it just displays without decimals.

A correct answer is 3, which can be typed in as follows: 3

What does the following function do?

```
int main() {
    int i, j;
    scanf("%d%d", &i, &j);
    printf("\n i=%d , j=%d", i, j);
    i = i - j;
    j = j + i;
    i = j - i;
    printf("\n i=%d , j=%d", i, j);
}
```

a. perform some algebraic calculation

b. interchange the values of variables i and j

c. add the absolute values of i and j ✖

Your answer is incorrect.
This function does not simply swap the values of variables i and j, but applies a specific algorithm to do this without using an auxiliary variable.

The algorithm used is based on simple arithmetic operations and consists of three steps:

Initializing values: The variables i and j are read from standard input using the scanf function and displayed using the printf function.

Interchanging values: Using the arithmetic operations i = i - j, j = j + i, i = j - i, the values of variables i and j are interchanged. Since these operations are performed on the initial values of i and j, the algorithm works correctly, ensuring that at the end i will contain the initial value of j and j will contain the initial value of i.

Display the result: After swapping the values, the new values of variables i and j are displayed using the printf function.

Therefore, the function efficiently and elegantly swaps the values of variables i and j using an algorithm based on simple arithmetic operations.

The correct answer is:
interchange the values of variables i and j

Tidy STACK question tool | Question is missing tests or variants.

The following code sequence is given:

```
int i, j = 0;
for (i = 1; i < 14; i += 3) {
    j++;
    if (i == 9) {
        break;
    }
}
printf("j=%d", j);
```

What will be the final value of j? 0

Your last answer was interpreted as follows:

$$0$$

✖ Incorrect answer.

In this code, the for loop iterates through the values of i starting at 1 and increasing by 3 each iteration, until i equals or exceeds the value 14. In each iteration, the variable j is incremented by 1.

However, inside the loop there is an if condition that checks if i is equal to 9. If this condition is met, the loop is broken using the break statement, and control is transferred to the printf statement.

If we analyze how the for loop behaves, we can see that i will take the values: 1, 4, 7, 10, 13. When i becomes 10, the condition i == 9 is false and the break statement is not executed. Therefore, the loop continues to iterate until i becomes 13.

So, j is incremented a total of 5 times, from its initial value of 0. Thus, at the end of the loop, j will have the value of 5.

The instruction printf("j=%d", j);, will display the value of j, and more precisely it will display j=5.

In this code, for is a loop that executes every time i is less than 14 and increments by 3 on each iteration. At each iteration, the variable j is incremented by 1.

The loop continues until i becomes 9. At this point, i == 9 is true, and the loop is terminated using break.

So the last value of i is 13 because it will never execute the if statement, and j is incremented by 5 times, resulting in a value of 5 for j.

Therefore, the displayed result will be "j=5".

A correct answer is 5, which can be typed in as follows: 5

Tidy STACK question tool | Question is missing tests or variants.

What will the code below display after execution?

```
int x = 3, a = 4;
int b = a - 2, c = b + x;

if (x == b)
    x = a;
else
    x = b;

if (x != b)
    c = c - b;
else
    c = c + a;

printf("c=%d\n", c);
```

c = 0

Your last answer was interpreted as follows:

0

✖ Incorrect answer.

By analyzing the given code, we can determine the final values of the variables and the output displayed by the printf function.

Initializing variables:

x is initialized to 3 and a to 4.

b is initialized to a - 2, so b becomes 4 - 2 = 2.

c is initialized to b + x, so c becomes 2 + 3 = 5.

Evaluation of the first if block:

x == b evaluates to 3 == 2, which is false.

Thus, x will be given the value of b, i.e. 2.

Evaluation of the second if block:

x != b evaluates to 2 != 2, which is false.

Therefore, the else block is executed, and c will be incremented by a, that is, by 4, so that c becomes 5 + 4 = 9.

Display the result:

At the end of the execution, the value of c is displayed, which is 9.

So after execution the displayed value will be c=9. The variable c is not explicitly reset after display, so its value remains 9 until the end of the program.

A correct answer is 9, which can be typed in as follows: 9

Tidy STACK question tool | Question is missing tests or variants.

What values will the following program display?

```
int x = 7, y = 4, m = 2, n, p;
p = (++x) - m + (x--);
n = p - 4 + (--y);
m = x + y;
printf("\n%d %d %d", m, n, p++);
```

m = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

We will analyze the code line by line to determine the final values of the variables m, n, and p.

Initializing variables:

x = 7, y = 4, m = 2, n and p are declared but have no explicitly defined initial values.

Evaluation of expressions:

p = (++x) - m + (x--):

++x increments x before evaluating the expression, so x becomes 8 and p gets the value 8.

m is 2, so p becomes 8 - 2 + 8 = 14.

Then x-- decrements x after evaluating the expression, so x becomes 7.

n = p - 4 + (--y):

p is 14 from the previous evaluation.

--y decrements y before evaluating the expression so that y becomes 3.

n becomes 14 - 4 + 3 = 13.

m = x + y:

x is now 7 and y is 3, so m becomes 7 + 3 = 10.

printf("\n%d %d %d", m, n, p++):

m, n, and p are displayed, but p++ is used for display, meaning that the value of p is displayed, then incremented.

Thus, the displayed values are 10, 13, and 14, in that order.

Updating variable p after display:

p is now incremented after display and becomes 15, in the subsequent case of using the value of the variable p, it will contain 15.

n = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

We will analyze the code line by line to determine the final values of the variables m, n, and p.

Initializing variables:

x = 7, y = 4, m = 2, n and p are declared but have no explicitly defined initial values.

Evaluation of expressions:

p = (++x) - m + (x--):

++x increments x before evaluating the expression, so x becomes 8 and p gets the value 8.

m is 2, so p becomes 8 - 2 + 8 = 14.

Then x-- decrements x after evaluating the expression, so x becomes 7.

n = p - 4 + (--y):

p is 14 from the previous evaluation.

--y decrements y before evaluating the expression so that y becomes 3.

n becomes 14 - 4 + 3 = 13.

m = x + y:

x is now 7 and y is 3, so m becomes 7 + 3 = 10.

printf("\n%d %d %d", m, n, p++):

m, n, and p are displayed, but p++ is used for display, meaning that the value of p is displayed, then incremented.

Thus, the displayed values are 10, 13, and 14, in that order.

Updating variable p after display:

p is now incremented after display and becomes 15, in the subsequent case of using the value of the variable p, it will contain 15.

p = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

We will analyze the code line by line to determine the final values of the variables m, n, and p.

Initializing variables:

x = 7, y = 4, m = 2, n and p are declared but have no explicitly defined initial values.

Evaluation of expressions:

p = (++x) - m + (x--):

++x increments x before evaluating the expression, so x becomes 8 and p gets the value 8.

m is 2, so p becomes 8 - 2 + 8 = 14.

Then x-- decrements x after evaluating the expression, so x becomes 7.

n = p - 4 + (--y):

p is 14 from the previous evaluation.

--y decrements y before evaluating the expression so that y becomes 3.

n becomes 14 - 4 + 3 = 13.

m = x + y:

x is now 7 and y is 3, so m becomes 7 + 3 = 10.

printf("\n%d %d %d", m, n, p++):

m, n, and p are displayed, but p++ is used for display, meaning that the value of p is displayed, then incremented.

Thus, the displayed values are 10, 13, and 14, in that order.

Updating variable p after display:

p is now incremented after display and becomes 15, in the subsequent case of using the value of the variable p, it will contain 15.

A correct answer is 10, which can be typed in as follows: `10`

A correct answer is 13, which can be typed in as follows: `13`

A correct answer is 14, which can be typed in as follows: `14`

Tidy STACK question tool | Question is missing tests or variants.

What will be the value of i after the execution of the following instructions:

```
i = 4;
i = i ? 18 : 2;
```

0

Your last answer was interpreted as follows:

0

✖ Incorrect answer.

The given code is a ternary expression, which has the form:

variable = condition ? value_if_true : value_if_false;

In this case, i is initialized to the value 4, and then the ternary expression is applied:

If i is nonzero (i is true), then i will be initialized to the value 18.

If i is zero (i is false), then i will be initialized to 2.

Since i is initialized to 4, which is non-zero, the ternary expression will assign the value 18 to i.

Therefore, after the execution of the instruction, the value of i will be 18.

A correct answer is 18, which can be typed in as follows: 18

Let the equivalents:

(A)
```
for (exp1; exp2; exp3) {
    instructions;
}
```

equivalent to:

```
exp1;
while(exp2) {
    instructions;
    exp3;
}
```

(B)
```
for (; exp; ) {
    instructions;
}
```

equivalent to:
```
while(exp) {
    instructions;
}
```

(C)
```
for (; ; ) {
    instructions;
}
```

equivalent to:
```
while(1) {
    instructions;
}
```

Which of the above equations are incorrect:

a. none

b. A, B

c. A, C ✗

(A) Equivalence:
for (exp1; exp2; exp3) {
instructions;
}
This for loop structure is composed of three parts:
exp1: Initialization, which is executed only once at the beginning of the loop and may contain initializations for control variables or other necessary operations.
exp2: The condition expression, which is evaluated before each iteration of the loop. If it evaluates to true (non-zero), the loop continues to execute. Otherwise, the loop terminates.
exp3: Increment, which is executed at the end of each iteration of the loop and may contain operations to update or modify control variables or other statements.
This for loop is equivalent to the following while structure:
exp1;
while(exp2) {
instructions;
exp3;
}
This structure uses a while loop to emulate the behavior of the for loop. Initialization is done before the loop, the condition is evaluated before each iteration, and incrementing is done at the end of each iteration.
(C) Equivalence:
for (; ;) {
instructions;
}
This for loop structure is simplified and contains no initialization, no condition expression, and no incrementing. This means that the loop will continue to execute repeatedly without checking for a specific stopping condition.
This for loop is equivalent to the following while structure:
while(1) {
instructions;
}
By using a constant expression that always evaluates to true (non-zero), the while loop will continue to execute without stopping. This while structure is often used to create infinite loops in code.

d. B, C

Let the structure be:

```
struct data {
    int day, month, year;
} d, *dd;
```

How to access the "day" field for the two variables?

Answer: 0 ✖

In the given structure, we have two variables:

d, which is a data struct variable.

dd, which is a pointer to a data struct object.

To access the "day" field for the two variables, we can use the dot (.) operator for the d variable and the arrow (->) operator for the dd pointer.

Accessing the "day" field for variable d: d.day

This is a direct way to access the "day" field for the variable d.

Accessing the "day" field for the dd pointer: dd->day

We use the arrow operator (->) to access the "day" field for the object that dd points to.

In conclusion, to access the "day" field for the two variables d and dd, we use d.day for the direct variable and dd->day for the pointer to the respective object.

The correct answer is: d.day and dd->day

Let x be a pointer to an integer. Do you write the instruction that performs the dynamic memory allocation?

Answer: 0 ✖

To dynamically allocate memory for a pointer to an integer in the C language, we can use the malloc() function or the calloc() function. These functions allow us to allocate memory space during program execution.

The malloc() function:

Syntax: void *malloc(size_t size);

malloc() is a standard function in the C library that is used to dynamically allocate memory during program execution.

This function takes a single argument: size, which is the number of bytes of memory we want to allocate.

The function returns a void * pointer to the beginning of the allocated memory area. It is necessary to convert this pointer to the desired type using an explicit cast.

It is important to always check if the memory allocation was successful. If there is not enough memory available to allocate, malloc() returns NULL.

calloc() function:

Syntax: void *calloc(size_t num_elements, size_t element_size);

calloc() is a standard C library function similar to malloc(), but is used to allocate memory for a specific number of elements, each of a specified size.

This function takes two arguments: num_elements, which is the number of elements we want to allocate, and element_size, which is the size of each element in bytes.

The function also returns a void * pointer to the beginning of the allocated memory area. It is necessary to convert this pointer to the desired type using an explicit cast.

As with malloc(), it is important to always check that the memory allocation was successful. If there is not enough memory available to allocate, calloc() returns NULL.

Both malloc() and calloc() functions are used for dynamic memory allocation, but calloc() is preferred when we need to allocate memory for a specific number of elements, while malloc() is more suitable for allocating an amount of memory specified in bytes. It is important to properly manage dynamically allocated memory to avoid memory leaks and other performance issues in our applications.

The correct answer is: x=(int)malloc(sizeof(int));

Tidy STACK question tool | Question is missing tests or variants.

What values will the following program display?

```
int x = 9, y = 5, a, b, c;
b = a = x++;
y++;
c = x + y;
b = (++y) + a;
printf("\n%d %d %d", a, ++b, c);
```

a = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

int x = 9, y = 5, a, b, c;

b = a = x++;

y++;

c = x + y;

b = (++y) + a;

printf("\n%d %d %d", a, ++b, c);

In this program, we will analyze the values that the variables a, b, and c will display at the end of execution, taking into account the initial values and the operations performed on them within the code.

Initialization and assignment of values:

int x = 9, y = 5, a, b, c;: We declare the variables x, y, a, b and c, and initialize the variables x and y with the values 9, 5.

b = a = x++;: We assign the values of x to the variables a and b, and then increment x. So a gets the initial value of x, which is 9, and b gets the value of a.

Incrementing y and calculating c:

y++;: We increment y by 1, so y will become 6.

c = x + y;: We calculate the sum of x and y, which are now x=10 and 6, and store it in c. So c will be 16.

Modification of b:

b = (++y) + a;: We increment y by 1 (so y becomes 7) and add the value of a to y. Since a is 9, adding 9 to 7 gives 16.

Display the result:

Finally, we display the values of a, ++b and c, but before displaying the value of b we will increment it by 1, making it 17.

Determination of values:

a: Gets the value of x from the first assignment, so it will be 9.

b: Calculated in the previous step as 17.

c: It was previously calculated as 16.

b = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

int x = 9, y = 5, a, b, c;

b = a = x++;

y++;

c = x + y;

b = (++y) + a;

printf("\n%d %d %d", a, ++b, c);

In this program, we will analyze the values that the variables a, b, and c will display at the end of execution, taking into account the initial values and the operations performed on them within the code.

Initialization and assignment of values:

int x = 9, y = 5, a, b, c;: We declare the variables x, y, a, b and c, and initialize the variables x and y with the values 9, 5.

b = a = x++;: We assign the values of x to the variables a and b, and then increment x. So a gets the initial value of x, which is 9, and b gets the value of a.

Incrementing y and calculating c:

y++;: We increment y by 1, so y will become 6.

c = x + y;: We calculate the sum of x and y, which are now x=10 and 6, and store it in c. So c will be 16.

Modification of b:

b = (++y) + a;: We increment y by 1 (so y becomes 7) and add the value of a to y. Since a is 9, adding 9 to 7 gives 16.

Display the result:

Finally, we display the values of a, ++b and c, but before displaying the value of b we will increment it by 1, making it 17.

Determination of values:

a: Gets the value of x from the first assignment, so it will be 9.

b: Calculated in the previous step as 17.

c: It was previously calculated as 16.

c = 0

Your last answer was interpreted as follows:

0

✖ **Incorrect answer.**

int x = 9, y = 5, a, b, c;

b = a = x++;

y++;

c = x + y;

b = (++y) + a;

printf("\n%d %d %d", a, ++b, c);

In this program, we will analyze the values that the variables a, b, and c will display at the end of execution, taking into account the initial values and the operations performed on them within the code.

Initialization and assignment of values:

int x = 9, y = 5, a, b, c;: We declare the variables x, y, a, b and c, and initialize the variables x and y with the values 9, 5.

b = a = x++;: We assign the values of x to the variables a and b, and then increment x. So a gets the initial value of x, which is 9, and b gets the value of a.

Incrementing y and calculating c:

y++;: We increment y by 1, so y will become 6.

c = x + y;: We calculate the sum of x and y, which are now x=10 and 6, and store it in c. So c will be 16.

Modification of b:

b = (++y) + a;: We increment y by 1 (so y becomes 7) and add the value of a to y. Since a is 9, adding 9 to 7 gives 16.

Display the result:

Finally, we display the values of a, ++b and c, but before displaying the value of b we will increment it by 1, making it 17.

Determination of values:

a: Gets the value of x from the first assignment, so it will be 9.

b: Calculated in the previous step as 17.

c: It was previously calculated as 16.

A correct answer is 9, which can be typed in as follows: 9

A correct answer is 17, which can be typed in as follows: 17

A correct answer is 16, which can be typed in as follows: 16

The declaration of variables is considered:

```
int m, *x, *y;
```

Which of the following assignments are correct?

- [x] a. y = &m; ✔
- [ ] b. y = x;
- [x] c. x = m; ✖
- [ ] d. *x = *m;
- [ ] e. *y = *x;

Your answer is partially correct.
To understand which of the given assignments are correct, we need to look at how variables are defined and how pointers are used.
Declaration of variables:

int m: m is an integer variable.

int *x, *y: x and y are pointers to integers.

Possible assignments:

a. x = m;: This assignment is incorrect. Although x is a pointer to integers and m is an integer, this assignment attempts to assign the value of the integer m directly to the pointer x, which is not valid. To store the address of m in x, we should use the & addressing operator like this: x = &m;.

b. *x = *m;: This assignment is incorrect. x and m are of different types. Attempting to dereference m and assign its dereferenced value to x is an error. To store the address of m in x, we should use the & addressing operator like this: x = &m;.

c. *y = *x;: This assignment is correct, only if we assume that x and y are correctly assigned pointers. The expression *y = *x means that the value stored at the address pointed to by x is assigned to the address pointed to by y.

d. y = &m;: This assignment is correct. &m represents the address of m, and y is an integer pointer, so it can store the address of m.

e. y = x;: This assignment is correct only if x is a correctly assigned pointer. The assignment causes y to store the same address as x, which is a valid operation for pointers.

Thus, the correct assignments are:

c. *y = *x;

d. y = &m;

e. y = x;

It is important to consider how we work with pointers in C and make sure we use the correct operator to get the address of the variable and avoid errors and unpredictable behavior in our code.

You have correctly selected 1.
The correct answers are:
*y = *x;,

y = &m;,

y = x;

Tidy STACK question tool | Question is missing tests or variants.

What will be the value of i after the execution of the following instructions:

```
i = 4;
i = i ? 18 : 2;
```

18

Your last answer was interpreted as follows:

18

Correct answer, well done.

Understanding ternary expressions is essential in programming because they provide a concise way to make decisions in code. In the case of your expression, i = i ? 18 : 2;, the value of variable i is updated according to condition i. If i has a non-zero value, it will be updated by 18, otherwise it will be updated by 2.

It is important to note that ternary expressions are useful for making code more concise and easy to understand. However, they should be used sparingly and written in a way that is easy to read and interpret for other programmers who may work with your code in the future.

A correct answer is 18, which can be typed in as follows: 18

Tidy STACK question tool | Question is missing tests or variants.

The following code sequence is given:

```
int i, j = 0;
for (i = 1; i < 14; i += 3) {
    j++;
    if (i == 9) {
        break;
    }
}
printf("j=%d", j);
```

What will be the final value of j? 5

Your last answer was interpreted as follows:

5

Correct answer, well done.

Your analysis is correct and shows a solid understanding of how the for loop works in combination with the break statement. We will go into more detail about the process to help you understand this concept even better.

Initialization: At the beginning of the loop, the variables i and j are initialized to 1 and 0 respectively.

Condition evaluation: In each iteration, i is incremented by 3 and the loop continues as long as i is less than 14.

Increment: At each iteration, the variable j is incremented by 1.

Checking the condition for i == 9: Inside the loop, there is an if statement that checks if i is equal to 9. If this condition is met, the loop breaks using the break statement.

Analyzing the values of i shows that i will take the values: 1, 4, 7, 10, 13. So the loop will stop when i becomes 10, because that is the first value that satisfies the condition i == 9.

Thus, the variable j is incremented 5 times in total, starting from its initial value of 0. Therefore, at the end of the loop, the value of j will be 5.

In conclusion, the correct values of i and j are calculated correctly, and the final displayed value of j should be 5.

A correct answer is 5, which can be typed in as follows: 5

We consider the variables a, b, c, d and e. Write the correct version of the statements, so that the following assignments are not accompanied by conversions that modify the assigned values.

c='a'	char ✔
a=3	int ✔
b=2.1	float ✔
d=-3.452	float ✔

Your answer is correct and demonstrates a solid understanding of data types and their correct use in C!
You used the appropriate data types for the variables a, b, c, and d and assigned literal values without requiring implicit conversions to change the assigned values. By using the appropriate data types and values correctly, you ensure accurate data storage in variables and avoid unwanted changes.

The correct answer is:
c='a' → char,

a=3 → int,

b=2.1 → float,

d=-3.452 → float

Tidy STACK question tool | Question is missing tests or variants.

The following program is considered:

```
int main() {
    int a, b, c, d, i;
    scanf("%d %d", &a, &b);

    if (a > b) {
        c = a;
        a = b;
        b = c;
    }

    d = 0;
    for (i = a; i <= b; i++) {
        if (i % 2 == 0) {
            d++;
        }
    }

    printf("%d", d);
}
```

What value is displayed for a=33 and b=18?

8

Your last answer was interpreted as follows:

8

✔ Correct answer, well done.

You correctly calculated the number of even numbers between a and b!

It is very important to understand how control structures like if and for work in our code. In this case, you correctly used structs to check and reverse the values of variables a and b when necessary, and then used a for loop to iterate through all the numbers between a and b, checking and counting the even numbers.

The useful information to remember from this problem is how we can use control structures to manipulate and process data, as well as how we can iterate through a sequence of numbers using a for loop.

A correct answer is 8, which can be typed in as follows: 8

Let the structure be:

```
struct data {
    int day, month, year;
} d, *dd;
```

How to access the "day" field for the two variables?

Answer: dd->day ☑

Your answer is partially correct!

In the given structure, we have two variables:

d, which is a data struct variable.

dd, which is a pointer to a data struct object.

To access the "day" field for the two variables, we can use the dot (.) operator for the d variable and the arrow (->) operator for the dd pointer.

Accessing the "day" field for variable d: d.day

This is a direct way to access the "day" field for the variable d.

Accessing the "day" field for the dd pointer: dd->day

We use the arrow operator (->) to access the "day" field for the object that dd points to.

In conclusion, to access the "day" field for the two variables d and dd, we use d.day for the direct variable and dd->day for the pointer to the respective object.

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We use the arrow operator (->) to access the "day" field for the object that dd points to.

In conclusion, to access the "day" field for the two variables d and dd, we use d.day for the direct variable and dd->day for the pointer to the respective object.

The correct answer is: d.day and dd->day

What does the following function do?

```
int main() {
    int i, j;
    scanf("%d%d", &i, &j);
    printf("\n i=%d , j=%d", i, j);
    i = i - j;
    j = j + i;
    i = j - i;
    printf("\n i=%d , j=%d", i, j);
}
```

a. add the absolute values of i and j

b. interchange the values of variables i and j ✔

c. perform some algebraic calculation

Your answer is correct.
The function you analyzed efficiently exchanges the values of variables i and j without using an auxiliary variable. We appreciate your effort in understanding and interpreting this algorithm.

It is important to understand that in this algorithm the values of variables i and j are interchanged using simple arithmetic operations. At first glance, this may seem unusual or complicated, but the main idea is that by using addition and subtraction, we can perform the exchange of values without using an auxiliary variable.

To help you better understand this process, we recommend that you follow the steps of the algorithm carefully and imagine how the values of the variables i and j change at each step.

The correct answer is:
interchange the values of variables i and j

The declaration of variables is considered:

```
int m, *x, *y;
```

Which of the following assignments are correct?

- [ ] a. x = m;
- [ ] b. *x = *m;
- [x] c. y = &m; ✔
- [x] d. *y = *x; ✔
- [x] e. y = x; ✔

Your answer is correct.
You correctly identified that assignments. These assignments are correct because &m represents the address of the variable m, and y is a pointer to an integer, so it can store the address of m or point to the same address as the pointer x and can retain the same value as stored in the address of x .

It is important to note that pointers are special variables that store the addresses of other variables. When using pointers, we need to be careful about the data types they refer to and make sure we use dereferencing and addressing correctly to avoid errors and unwanted behavior in our code.

The correct answers are:
*y = *x;,

y = &m;,

y = x;

Specify the displayed values, if the numerical values 5 2 -3 are to be read in the indicated order:

```
int main() {
    int a, b;
    scanf("%d%d%d", &a, &b, &a);
    printf("%d,", a);
    printf("%d,", b);
    printf("%d", a + b);
}
```

- a. 5 2 7
- b. there are syntax errors
- c. -3 2 -1 ✔
- d. 5 2 7

Your answer is correct.
You have used the scanf and printf functions correctly to read and display the read values, i.e. the sum of the first two numbers.

Explanations:

Function scanf("%d%d%d", &a, &b, &a); reads three integers from standard input. The last value read to overwrite the previous value of variable a.

The read values are then displayed using the printf function. So:

The variable a will display the last value read for a.

The variable b will display the value read for b.

The sum of the first two numbers, a + b, will display the sum of the values originally read for a and b.

If you enter the values 5, 2 and -3 in this order, the displayed values will be:

a: -3 (last value read for a)

b: 2

a + b: -1 (sum of initially read values for a and b: 5 + 2 = 7, but last read value for a was -3)

You have shown a clear understanding of how to use the scanf and printf functions.

The correct answer is:
-3 2 -1

Tidy STACK question tool | Question is missing tests or variants.

What will the code below display after execution?

```
int x = 3, a = 4;
int b = a - 2, c = b + x;

if (x == b)
    x = a;
else
    x = b;

if (x != b)
    c = c - b;
else
    c = c + a;

printf("c=%d\n", c);
```

c = 9

Your last answer was interpreted as follows:

9

✔ Correct answer, well done.

You have done an accurate analysis of the code and successfully determined the final values of the variables and the output displayed by the program.

First, you have initialized the variables x, a, b and c as required. Next, you carefully followed the logic of the if-else blocks. Although x was not explicitly reinitialized after the first if block, you correctly understood that its value is updated with that of b. Next, you correctly evaluated the expressions in the second if-else block and updated the value of variable c accordingly . Result display was handled correctly and the displayed result (c=9) was determined accurately.

This careful analysis of code and clear understanding of how variables are updated and used within the program demonstrates a solid programming problem-solving ability. Keep practicing and exploring different aspects of programming to further develop your skills.

A correct answer is 9, which can be typed in as follows: 9

Let the equivalents:

(A)

```
for (exp1; exp2; exp3) {
    instructions;
}
```

equivalent to:

```
exp1;
while(exp2) {
    instructions;
    exp3;
}
```

(B)

```
for (; exp; ) {
    instructions;
}
```

equivalent to:

```
while(exp) {
    instructions;
}
```

(C)

```
for (; ; ) {
    instructions;
}
```

equivalent to:

```
while(1) {
    instructions;
}
```

Which of the above equations are incorrect:

- a. A, B
- b. B, C
- c. A, C
- d. none ✔

Your answer is correct.
Your correct answer demonstrates a deep understanding of the equivalences between the for and while loop structures in C. It is important to understand how to transcribe logic between these two types of loops because this gives you flexibility in developing and understanding your code.

The for and while loop stru[The current page number in the document. Click or tap to open the Navigation Pane.]flow in programming. While for loops are often used w[illegible]terations required, while loops are useful when we need to continue executing a statement as long as a specific condition is true.

It is important to understand that each part of the for structure serves a specific purpose: initialization, condition evaluation, and increment/decrement. These parts can be appropriately transcribed into the while structure, along with the statements to be executed in each iteration.

In conclusion, properly understanding the equivalences between for and while loops is essential to developing your programming skills and creating efficient and maintainable C code.

The correct answer is:
none

Tidy STACK question tool | Question is missing tests or variants.

Specify what will be displayed following the execution of the program sequence below for n=5 (s,n and k are integer variables).

```
s = 0, k = 1;
while (k <= n) {
    s += k;
    k += 2;
}
printf("s=%d", s);
```

s = 9

Your last answer was interpreted as follows:

9

✔ Correct answer, well done.

You have correctly identified that the program calculates the sum of all odd numbers between 1 and n, inclusive, and displays the result. It is important to understand how loops work and how variables change within them to solve problems of this type.

In this case, it is essential to understand that k is incremented by 2 at each iteration so that we only add odd numbers. Also, the variable s stores the sum of these numbers, and at the end of the loop, we display this sum.

The useful information we should remember is that we can use loops to iterate through a sequence of numbers and perform various operations based on their values.

A correct answer is 9, which can be typed in as follows: 9

Tidy STACK question tool | Question is missing tests or variants.

Let the variable *n* be the value 3.14159665. What does the following instruction display:

```
printf("%.0f", n);
```

3

Your last answer was interpreted as follows:

3

✔ Correct answer, well done.

You have correctly used the printf function with the format specifier %.0f to display the value of the variable n without any decimals. If n has no decimal part, it will be rounded to the nearest integer and the displayed result will be the whole result.

In our case, the value of the variable n is 3.14159665. By applying the %.0f format specifier, the value is displayed without any decimals, so the result is 3.

A correct answer is 3, which can be typed in as follows: 3

Let x be a pointer to an integer. Do you write the instruction that performs the dynamic memory allocation?

Answer: x=(int*)malloc(sizeof(int));

To dynamically allocate memory for a pointer to an integer in the C language, we can use the malloc() function or the calloc() function. These functions allow us to allocate memory space during program execution.

calloc() function:

Syntax: void *calloc(size_t num_elements, size_t element_size);

calloc() is a standard C library function similar to malloc(), but is used to allocate memory for a specific number of elements, each of a specified size.

This function takes two arguments: num_elements, which is the number of elements we want to allocate, and element_size, which is the size of each element in bytes.

The function also returns a void * pointer to the beginning of the allocated memory area. It is necessary to convert this pointer to the desired type using an explicit cast.

As with malloc(), it is important to always check that the memory allocation was successful. If there is not enough memory available to allocate, calloc() returns NULL.

Both malloc() and calloc() functions are used for dynamic memory allocation, but calloc() is preferred when we need to allocate memory for a specific number of elements, while malloc() is more suitable for allocating an amount of memory specified in bytes. It is important to properly manage dynamically allocated memory to avoid memory leaks and other performance issues in our applications.

To dynamically allocate memory for a pointer to an integer in the C language, we can use the malloc() function or the calloc() function. These functions allow us to allocate memory space during program execution.

The malloc() function:

Syntax: void *malloc(size_t size);

malloc() is a standard function in the C library that is used to dynamically allocate memory during program execution.

This function takes a single argument: size, which is the number of bytes of memory we want to allocate.

The function returns a void * pointer to the beginning of the allocated memory area. It is necessary to convert this pointer to the desired type using an explicit cast.

It is important to always check if the memory allocation was successful. If there is not enough memory available to allocate, malloc() returns NULL.

calloc() function:

Syntax: void *calloc(size_t num_elements, size_t element_size);

calloc() is a standard C library function similar to malloc(), but is used to allocate memory for a specific number of elements, each of a specified size.

This function takes two arguments: num_elements, which is the number of elements we want to allocate, and element_size, which is the size of each element in bytes.

The function also returns a void * pointer to the beginning of the allocated memory area. It is necessary to convert this pointer to the desired type using an explicit cast.

As with malloc(), it is important to always check that the memory allocation was successful. If there is not enough memory available to allocate, calloc() returns NULL.

Both malloc() and calloc() functions are used for dynamic memory allocation, but calloc() is preferred when we need to allocate memory for a specific number of elements, while malloc() is more suitable for allocating an amount of memory specified in bytes. It is important to properly manage dynamically allocated memory to avoid memory leaks and other performance issues in our applications.

The correct answer is: x=(int)malloc(sizeof(int));

Tidy STACK question tool | Question is missing tests or variants.

What values will the following program display?

```
int x = 9, y = 5, a, b, c;
b = a = x++;
y++;
c = x + y;
b = (++y) + a;
printf("\n%d %d %d", a, ++b, c);
```

a = 9

Your last answer was interpreted as follows:

9

Correct answer, well done.

You have carefully analyzed each step of the code and correctly calculated the values of the variables a, b, and c. It is essential to understand how the assignment and increment operators work in the context of complex expressions and to pay attention to the order in which these operations are performed.

An important point that you illustrated with this problem is how the increment (++) and assignment (=) operators can influence the values of variables and the final output of the program.

b = 17

Your last answer was interpreted as follows:

17

Correct answer, well done.

You have carefully analyzed each step of the code and correctly calculated the values of the variables a, b, and c. It is essential to understand how the assignment and increment operators work in the context of complex expressions and to pay attention to the order in which these operations are performed.

An important point that you illustrated with this problem is how the increment (++) and assignment (=) operators can influence the values of variables and the final output of the program.

c = 16

Your last answer was interpreted as follows:

16

Correct answer, well done.

You have carefully analyzed each step of the code and correctly calculated the values of the variables a, b, and c. It is essential to understand how the assignment and increment operators work in the context of complex expressions and to pay attention to the order in which these operations are performed.

An important point that you illustrated with this problem is how the increment (++) and assignment (=) operators can influence the values of variables and the final output of the program.

Tidy STACK question tool | Question is missing tests or variants.

What values will the following program display?

```
int x = 7, y = 4, m = 2, n, p;
p = (++x) - m + (x--);
n = p - 4 + (--y);
m = x + y;
printf("\n%d %d %d", m, n, p++);
```

m = 10

Your last answer was interpreted as follows:

$$10$$

Correct answer, well done.

You have done a correct analysis of the code and determined the final values of the variable m.

m becomes 10 because it is the sum of x (7) and y (3).

n = 13

Your last answer was interpreted as follows:

$$13$$

Correct answer, well done.

You have done a correct analysis of the code and determined the final values of the variable n.

n becomes 13, calculated using the value of p (14) and decrementing y by 1.

p = 14

Your last answer was interpreted as follows:

$$14$$

Correct answer, well done.

You have done a correct analysis of the code and determined the final values of the variable p.

p becomes 14, because the increment used in the printf() function will be used later in the program, not at the time of display.