Index	Module	Question	Type	Answer	Responses	% correct	A	B	C	D	X	SP correct	SP wrong	Math Area
44	2H	22	Student-produced	[redacted]	6	0.00%						0	6	AdvancedMath

Math: Question 22

$a=64$ $\quad b=-(16a+4b)$ $\quad c=ab$

sum and product of the roots of a quadratic

$$64x^2 - (16a+4b)x + ab = 0$$

In the given equation, a and b are positive constants. The sum of the solutions to the given equation is $k(4a+b)$, where k is a constant. What is the value of k?

$$-\frac{b}{a} = \frac{-(-(16a+4b))}{64} = k(4a+b)$$

$$\frac{4(4a+b)}{64} = k(4a+b)$$

$$\frac{4}{64} = k$$

$$k = \frac{1}{16}$$

Can Desmos make this easier?

It might, but the use is sophisticated.

1 $f(x) = 64x^2 - (16a+4b)$

2 $[f(x_1), f(x_2)] \sim [0,0]\{x_1$

REGRESSION PARAMETERS

$a = 3.98753$ $\quad b = 0.996536$

$x_1 = 0.996883$ $\quad x_2 = 0.0622835$

STATISTICS

$RMSE = 2.84 \times 10^{-15}$

RESIDUALS

e_1

3 $x_1 + x_2$

$= 1.05916645961$

4 $4a + b$

$= 16.9466633538$

5 $\dfrac{(x_1 + x_2)}{4a+b}$

$= 0.0625$

Answer

.0625, 1/16

You answered 1/16. The correct answer is .0625, 1/16.

Rationale

The correct answer is $\frac{1}{16}$. Let p and q represent the solutions to the given equation. Then, the given equation can be rewritten as $64(x-p)(x-q)=0$, or $64x^2 - 64(p+q) + pq = 0$. Since this equation is equivalent to the given equation, it follows that $-(16a+4b) = -64(p+q)$. Dividing both sides of this equation by -64 yields $\frac{16a+4b}{64} = p+q$, or $\frac{1}{16}(4a+b) = p+q$. Therefore, the sum of the solutions to the given equation, $p+q$, is equal to $\frac{1}{16}(4a+b)$. Since it's given that the sum of the solutions to the given equation is $k(4a+b)$, where k is a constant, it follows that $k = \frac{1}{16}$. Note that 1/16, .0625, 0.062, and 0.063 are examples of ways to enter a correct answer.

Alternate approach: The given equation can be rewritten as $64x^2 - 4(4a+b)x + ab = 0$, where a and b are positive constants. Dividing both sides of this equation by 4 yields $16x^2 - (4a+b)x + \frac{ab}{4} = 0$. The solutions for a quadratic equation in the form $Ax^2 + Bx + C = 0$, where A, B, and C are constants, can be calculated using the quadratic formula, $x = \frac{-B+\sqrt{B^2-4AC}}{2A}$ and $x = \frac{-B-\sqrt{B^2-4AC}}{2A}$. It follows that the sum of the solutions to a quadratic equation in the form $Ax^2+Bx+C=0$ is $\frac{-B+\sqrt{B^2-4AC}}{2A} + \frac{-B-\sqrt{B^2-4AC}}{2A}$, which can be rewritten as $\frac{-B+-B+\sqrt{B^2-4AC}-\sqrt{B^2-4AC}}{2A}$, which is equivalent to $\frac{-2B}{2A}$, or $-\frac{B}{A}$. In the equation $16x^2 - (4a+b)x + \frac{ab}{4} = 0$, $A = 16$, $B = -(4a+b)$, and $C = \frac{ab}{4}$. Substituting 16 for A and $-(4a+b)$ for B in $-\frac{B}{A}$ yields $-\frac{-(4a+b)}{16}$, which can be rewritten as $\frac{1}{16}(4a+b)$. Thus, the sum of the solutions to the given equation is $\frac{1}{16}(4a+b)$. Since it's given that the sum of the solutions to the given equation is $k(4a+b)$, where k is a constant, it follows that $k = \frac{1}{16}$.

$ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$\frac{2}{3}$

numerator — enumerate = to count

denominator — denominate = to give a name

$$x_1 = \frac{-b + \sqrt{b^2-4ac}}{2a} \qquad x_2 = \frac{-b - \sqrt{b^2-4ac}}{2a}$$

Sum of the roots

$$x_1 + x_2 = \frac{-b + \sqrt{b^2-4ac}}{2a} + \frac{-b - \sqrt{b^2-4ac}}{2a}$$

$$= \frac{-2b + 0}{2a} = \frac{-2b}{2a} = \boxed{-\frac{b}{a}}$$

sum of the roots of a quadratic

Product of the roots

$$\frac{-b + \sqrt{b^2-4ac}}{2a} \cdot \frac{-b - \sqrt{b^2-4ac}}{2a}$$

$$= \frac{(-b + \sqrt{\text{ugly}}) \cdot (-b - \sqrt{\text{ugly}})}{2a \cdot 2a}$$

$$= \frac{(-b)^2 - (\sqrt{\text{ugly}})^2}{4a^2}$$

$$= \frac{b^2 - \text{ugly}}{4a^2}$$

$(x+5)(x-5)$

$= x^2 \cancel{-5x} \cancel{+5x} - 25$

$= x^2 - 25$

$$= \frac{b^2 - (b^2 - 4ac)}{4a^2} = \frac{\cancel{b^2} \cancel{-b^2} + 4ac}{4a^2}$$

$$= \frac{\cancel{4a}c}{\cancel{4a}a} = \boxed{\frac{c}{a}}$$

product of the roots of a quadratic

roots of an equation $\qquad 3x+5=0$

= solutions of an equation

zeros of a function $\qquad f(x)=3x+5$

x-intercepts of a graph (of a function)

where graph of $f(x)=3x+5$ hits the x-axis

Index	Module	Question	Type	Answer	Responses	% correct	A	B	C	D	X	SP correct	SP wrong
22	1	22	Multiple-choice	B	7	28.57%	1	2	2	2	0		

Math: Question 22

$$f(x) = \frac{a-19}{x} + 5$$

In the given function f, a is a constant. The graph of function f in the xy-plane, where $y = f(x)$, is translated 3 units down and 4 units to the right to produce the graph of $y = g(x)$. Which equation defines function g?

A. $g(x) = \frac{a-19}{x+4} + 2$

B. $g(x) = \frac{a-19}{x-4} + 2$

C. $g(x) = \frac{a-22}{x+4} + 5$

D. $g(x) = \frac{a-22}{x-4} + 5$

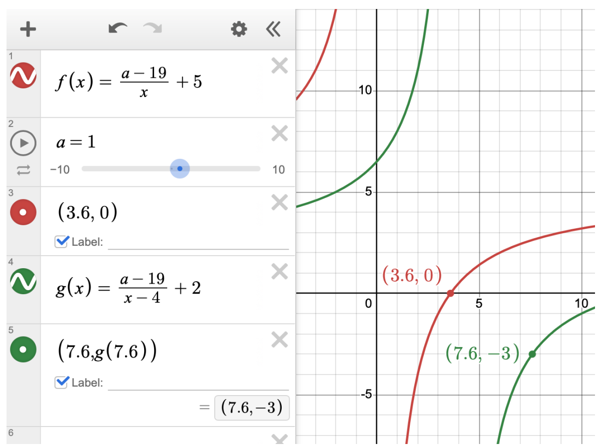
$f(x) = \frac{a-19}{x} + 5 - 3$

$x-4$

Can Desmos make this easier?

Yes, but it's slower than if you understand how transformations work.

$g(x) = \frac{a-19}{x-4} + 2$



Answer

You selected answer B. The correct answer is B.

Rationale

Choice B is correct. It's given that the graph of $y = g(x)$ is produced by translating the graph of $y = f(x)$ 3 units down and 4 units to the right in the xy-plane. Therefore, function g can be defined by an equation in the form $g(x) = f(x-4) - 3$. Function f is defined by the equation $f(x) = \frac{a-19}{x} + 5$, where a is a constant. Substituting $x - 4$ for x in the equation $f(x) = \frac{a-19}{x} + 5$ yields $f(x-4) = \frac{a-19}{x-4} + 5$. Substituting $\frac{a-19}{x-4} + 5$ for $f(x-4)$ in the equation $g(x) = f(x-4) - 3$ yields $g(x) = \frac{a-19}{x-4} + 5 - 3$, or $g(x) = \frac{a-19}{x-4} + 2$. Therefore, the equation that defines function g is $g(x) = \frac{a-19}{x-4} + 2$.

Choice A is incorrect. This equation defines a function whose graph is produced by translating the graph of $y = f(x)$ 3 units down and 4 units to the left, not 3 units down and 4 units to the right.

Choice C is incorrect. This equation defines a function whose graph is produced by translating the graph of $y = f(x)$ 4 units to the left, not 3 units down and 4 units to the right.

Choice D is incorrect. This equation defines a function whose graph is produced by translating the graph of $y = f(x)$ 4 units to the right, not 3 units down and 4 units to the right.

$y = f(x)$

translation

+ or −

on x, horizontal

on y, vertical

?

dilation reflection

$y = f(x-h) + k$

$y = f(x)$ tr. 4 units to the right

$y = f(x-4)$

$y = f(x)$ tr. 4 units to the left

$y = f(x+4)$

$y = f(x)$ tr. 4 units up

$y = f(x) + 4$

$y = f(x)$ tr. 4 units down

$y = f(x) - 4$

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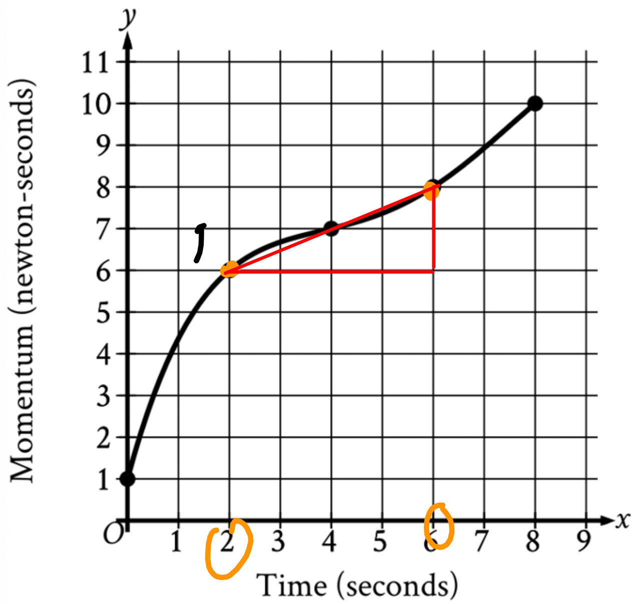
Index	Module	Question	Type	Answer	Responses	% correct	A	B	C	D	X	SP correct	SP wrong	Math Area	S
39	2H	17	Student-produced	[redacted]	6	16.67%						1	5	DataAnalysis	I

Math: Question 17



$M = \frac{\text{rise}}{\text{run}} = \frac{2}{4}$

The graph shows the momentum y, in newton-seconds, of an object x seconds after the object started moving, for $0 \le x \le 8$. What is the average rate of change, in newton-seconds per second, in the momentum of the object from $x = 2$ to $x = 6$?

Can Desmos make this easier?

Not really; there are things you could do, but they complicate it.

Answer

0.5, 1/2

You answered 1/2. The correct answer is 0.5, 1/2.

Rationale

The correct answer is $\frac{1}{2}$. For the graph shown, x represents time, in seconds, and y represents momentum, in newton-seconds. Therefore, the average rate of change, in newton-seconds per second, in the momentum of the object between two x-values is the difference in the corresponding y-values divided by the difference in the x-values. The graph shows that at $x = 2$, the corresponding y-value is 6. The graph also shows that at $x = 6$, the corresponding y-value is 8. It follows that the average rate of change, in newton-seconds per second, from $x = 2$ to $x = 6$ is $\frac{8-6}{6-2}$, which is equivalent to $\frac{2}{4}$, or $\frac{1}{2}$. Note that 1/2 and .5 are examples of ways to enter a correct answer.

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Index	Module	Question	Type	Answer	Responses	% correct	A	B	C	D	X	SP correct	SP wrong
21	1	21	Student-produced	-7	7	42.86%						3	4

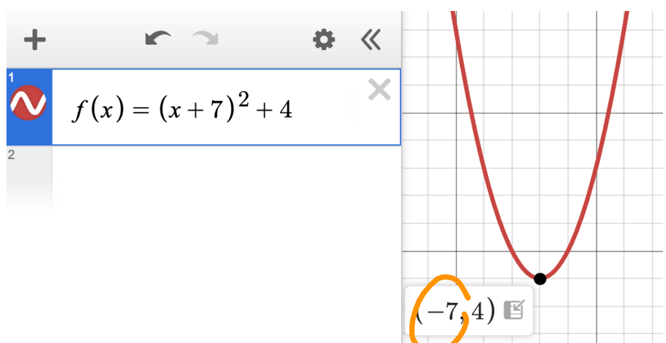
Math: Question 21

$$f(x) = (x+7)^2 + 4$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

Can Desmos make this easier?

Yes, Desmos makes it stupidly simple.



value of x

Answer

-7

You answered -7. The correct answer is -7.

Rationale

The correct answer is -7. For a quadratic function defined by an equation of the form $f(x) = a(x-h)^2 + k$, where a, h, and k are constants and $a > 0$, the function reaches its minimum when $x = h$. In the given function, $a = 1$, $h = -7$, and $k = 4$. Therefore, the value of x for which $f(x)$ reaches its minimum is -7.

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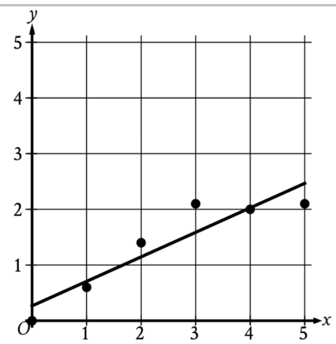
Index	Module	Question	Type	Answer	Responses	% correct	A	B	C	D	X	SP correct	SP wrong
30	2H	8	Multiple-choice	B	6	50.00%	0	3	2	1	0		

Math: Question 8

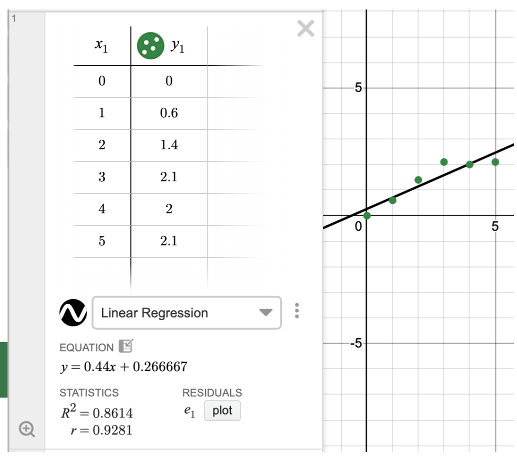
The scatterplot shows the relationship between x and y. A line of best fit is also shown.



Which of the following is closest to the slope of the line of best fit shown?

A. -2.27
B. -0.44
C. 0.44
D. 2.27

Can Desmos make this easier?



Answer

You selected answer C. The correct answer is C.

Rationale

Choice C is correct. It's given that the scatterplot shows the relationship between two variables, x and y, and a line of best fit is shown. For the line of best fit shown, for each increase in the value of x by 1, the corresponding value of y increases by a constant rate. It follows that the relationship between the variables x and y has a positive linear trend. A line in the xy-plane that passes through the points (a, b) and (c, d) has a slope of $\frac{d-b}{c-a}$. The line of best fit shown passes approximately through the points $(0, 0.25)$ and $(4, 2)$. It follows that the slope of this line is approximately $\frac{2-0.25}{4-0}$, which is equivalent to 0.4375. Therefore, of the given choices, 0.44 is closest to the slope of the line of best fit shown.

Choice A is incorrect. This is the slope of a line of best fit for a relationship between x and y that has a negative, rather than a positive, linear trend.

Choice B is incorrect. This is the slope of a line of best fit for a relationship between x and y that has a negative, rather than a positive, linear trend.

Choice D is incorrect and may result from conceptual or calculation errors.

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Index	Module	Question	Type	Answer	Responses	% correct	A	B	C	D	X	SP correct	SP wrong	Math Area
37	2H	15	Multiple-choice	[redacted]	8	50.00%	1	2	4	0	1			Algebra

Math: Question 15

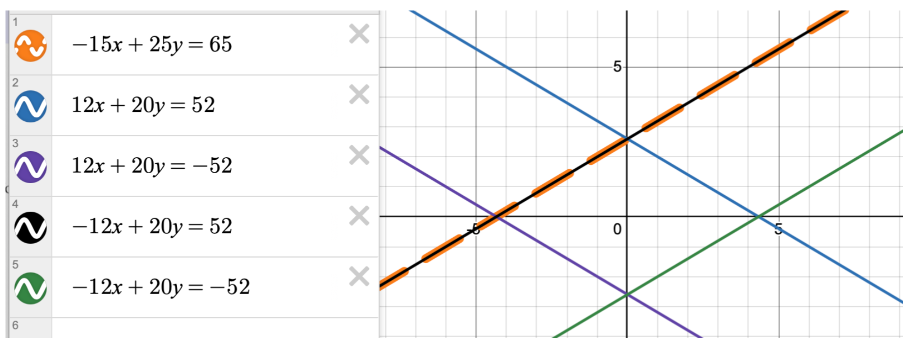
$$-15x + 25y = 65$$

One of the two equations in a system of linear equations is given. The system has infinitely many solutions. Which of the following could be the second equation in the system?

A. $12x + 20y = 52$
B. $12x + 20y = -52$
C. $-12x + 20y = 52$
D. $-12x + 20y = -52$

Can Desmos make this easier?

Sure. Graph the original, then graph choices until one overlaps it.



Answer

You selected answer C. The correct answer is C.

Rationale

Choice C is correct. It's given that the system has infinitely many solutions. A system of two linear equations has infinitely many solutions when the two linear equations are equivalent. Dividing both sides of the given equation by 5 yields $-3x + 5y = 13$. Dividing both sides of choice C by 4 also yields $-3x + 5y = 13$, so choice C is equivalent to the given equation. Thus, choice C could be the second equation in the system.

Choice A is incorrect. The system consisting of this equation and the given equation has one solution, not infinitely many solutions.

Choice B is incorrect. The system consisting of this equation and the given equation has one solution, not infinitely many solutions.

Choice D is incorrect. The system consisting of this equation and the given equation has no solution, not infinitely many solutions.

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Math: Question 9

Line k is defined by $y = \frac{1}{4}x + 1$. Line j is parallel to line k in the xy-plane. What is the slope of j?

Can Desmos make this easier?

No, this is just a fact you have to know.

Answer

.25, 1/4

You answered 1/4. The correct answer is .25, 1/4.

Rationale

The correct answer is $\frac{1}{4}$. It's given that line k is defined by $y = \frac{1}{4}x + 1$. It's also given that line j is parallel to line k in the xy-plane A line in the xy-plane represented by an equation in slope-intercept form $y = mx + b$ has a slope of m and a y-intercept of $(0, b)$. Therefore, the slope of line k is $\frac{1}{4}$. Since parallel lines have equal slopes, the slope of line j is $\frac{1}{4}$. Note that 1/4 and .25 are example of ways to enter a correct answer.

Index	Module	Question	Type	Answer	Responses	% correct	A	B	C	D	X	SP correct	SP wrong
10	1	10	Multiple-choice	[redacted]	7	57.14%	4	1	0	2	0		

Math: Question 10

factors of 36
1, 2, 3, 4, 6, 9 12, 18, 36

Which expression is a factor of $2x^2 + 38x + 10$?

A. 2
B. $5x$
C. $38x$
D. $2x^2$

$$2x^2 + 38x + 10$$

Can Desmos make this easier?

If you are really clueless, possibly, but you probably shouldn't choose it.

Answer

You selected answer A. The correct answer is A.

Rationale

Choice A is correct. Since 2 is a common factor of each of the terms in the given expression, the expression can be rewritten as $2(x^2 + 19x + 5)$. Therefore, the factors of the given expression are 2 and $x^2 + 19x + 5$. Of these two factors, only 2 is listed as a choice.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is a term of the given expression, not a factor of the given expression.

Choice D is incorrect. This is a term of the given expression, not a factor of the given expression.

Index	Module	Question	Type	Answer	Responses	% correct	A	B	C	D	X	SP correct	SP wrong
20	1	20	Multiple-choice	[redacted]	7	57.14%	1	1	4	1	0		

Math: Question 20

$$x+3=-2y+5$$

$$x-3=2y+7$$

The solution to the given system of equations is (x, y). What is the value of $2x$?

A. -2

B. 6

C. 12

D. 24

Can Desmos make this easier?

Definitely. You can solve by graphing, or use regression.

$\left[x_1+3, x_1-3\right] \sim \left[-2y_1+5, 2y_1+7\right]$

REGRESSION PARAMETERS

$x_1=6$ $y_1=-2$

STATISTICS

$RMSE=0$

RESIDUALS

e_1

$2x_1$

$=12$

Answer

You selected answer B. The correct answer is B.

Rationale

Choice B is correct. It's given that for the function h, $h(n)$ is the estimated maximum height, in feet, of the ball after it has hit the ground n times. It's also given that the function h estimates that the maximum height reached after each time the ball hits the ground is 85% of the maximum height reached after the previous time the ball hit the ground. It follows that h is a decreasing exponential function that can be written in the form $h(n)=a\left(\frac{p}{100}\right)^n$, where a is the initial height, in feet, the ball was dropped from and the function estimates that the maximum height reached after each time the ball hits the ground is $p\%$ of the maximum height reached after the previous time the ball hit the ground. It's given that the ball is dropped from an initial height of 22 feet. Therefore, $a=22$. Since the function h estimates that the maximum height reached after each time the ball hits the ground is 85% of the maximum height reached after the previous time the ball hit the ground, $p=85$. Substituting 22 for a and 85 for p in the equation $h(n)=a\left(\frac{p}{100}\right)^n$ yields $h(n)=22\left(\frac{85}{100}\right)^n$, or $h(n)=22(0.85)^n$.

Equivalent expressions

0:19 Question 2ba76e5

Hide Advanced Math - Equivalent expressions

$$0.36x^2 + 0.63x + 1.17$$

The given expression can be rewritten as $a\left(4x^2 + 7x + 13\right)$, where a is a constant. What is the value of a?

$4a = 0.36$

$a = \dfrac{0.36}{4} = 0.09$

The correct answer is $.09$. It's given that the expression $0.36x^2 + 0.63x + 1.17$ can be rewritten as $a\left(4x^2 + 7x + 13\right)$. Applying the distributive property to the expression $a\left(4x^2 + 7x + 13\right)$ yields $4ax^2 + 7ax + 13a$. Therefore, $0.36x^2 + 0.63x + 1.17$ can be rewritten as $4ax^2 + 7ax + 13a$. It follows that in the expressions $0.36x^2 + 0.63x + 1.17$ and $4ax^2 + 7ax + 13a$, the coefficients of x^2 are equivalent, the coefficients of x are equivalent, and the constant terms are equivalent. Therefore, $0.36 = 4a$, $0.63 = 7a$, and $1.17 = 13a$. Solving any of these equations for a yields the value of a. Dividing both sides of the equation $0.36 = 4a$ by 4 yields $0.09 = a$. Therefore, the value of a is 0.09. Note that .09 and 9/100 are examples of ways to enter a correct answer.

0:08 Question 6d9852c

Hide Advanced Math - Equivalent expressions

$(x-11y)(2x-3y)-12y(-2x+3y)$

Which of the following is equivalent to the expression above?

- $x-23y$ ×
- $2x^2-xy-3y^2$
- $2x^2+24xy+36y^2$
- $2x^2-49xy+69y^2$ ×

Choice B is correct. Expanding all terms yields (x – 11y)(2x – 3y) – 12y(–2x + 3y), which is equivalent to $2x^2 - 22xy - 3xy + 33y^2 + 24xy - 36y^2$. Combining like terms gives $2x^2 - xy - 3y^2$.

Choice A is incorrect and may be the result of using the sums of the coefficients of the existing x and y terms as the coefficients of the x and y terms in the new expressions. Choice C is incorrect and may be the result of incorrectly combining like terms. Choice D is incorrect and may be the result of using the incorrect sign in front of the 12y term.

Solving equations in one variable https://satquestionbank.org/start/1ad48ed3c62b

Question 1730960c

Show Advanced Math - Nonlinear equations in one variable and systems of equations in two variables

$$\frac{2(x+1)}{x+5} = 1 - \frac{1}{x+5}$$

What is the solution to the equation above?

- 0
- 2
- 3
- 5

desmos | Graphing Calculator | College B

Choice B is correct. Since $\frac{x+5}{x+5}$ is equivalent to 1, the right-hand side of the given equation can be rewritten as $\frac{x+5}{x+5} - \frac{1}{x+5}$, or $\frac{x+4}{x+5}$. Since the left- and right-hand sides of the equation $\frac{2(x+1)}{x+5} = \frac{x+4}{x+5}$ have the same denominator, it follows that $2(x+1) = x+4$. Applying the distributive property of multiplication to the expression $2(x+1)$ yields $2(x)+2(1)$, or $2x+2$. Therefore, $2x+2 = x+4$. Subtracting x and 2 from both sides of this equation yields $x = 2$.

Choices A, C, and D are incorrect. If $x = 0$, then $\frac{2(0+1)}{0+5} = 1 - \frac{1}{0+5}$. This can be rewritten as $\frac{2}{5} = \frac{4}{5}$, which is a false statement. Therefore, 0 isn't a solution to the given equation. Substituting 3 and 5 into the given equation yields similarly false statements.

Question 1a20a239

Show Advanced Math - Nonlinear equations in one variable and systems of equations in two variables

$$x^2 - 5x - 24 = 0$$

What is the sum of the solutions to the given equation?

Answer

The correct answer is 5. The given quadratic equation can be rewritten in factored form as $(x-8)(x+3) = 0$. Based on the zero product property, it follows that $x - 8 = 0$ or $x + 3 = 0$. Adding 8 to both sides of the equation $x - 8 = 0$ yields $x = 8$. Subtracting 3 from both sides of the equation $x + 3 = 0$ yields $x = -3$. Therefore, the solutions to the given equation are 8 and -3. It follows that the sum of the solutions to the given equation is $8 + (-3)$, or 5.

Question 23863e8c

Show Advanced Math - Nonlinear equations in one variable and systems of equations in two variables

$$\sqrt{x+4} = 11$$

What value of x satisfies the equation above?

Answer

desmos | Graphing Calculator | College

The correct answer is 117. Squaring both sides of the given equation gives $x+4 = 11^2$, or $x+4 = 121$. Subtracting 4 from both sides of this equation gives $x = 117$.

Question 220f67ab

Show Advanced Math - Nonlinear equations in one variable and systems of equations in two variables

$$6x^2 + 5x - 7 = 0$$

What are the solutions to the given equation?

- $\frac{-5 \pm \sqrt{25+168}}{12}$
- $\frac{-6 \pm \sqrt{25+168}}{12}$
- $\frac{-5 \pm \sqrt{36-168}}{12}$
- $\frac{-6 \pm \sqrt{36-168}}{12}$

desmos | Graphing Calculator | College

Choice A is correct. The quadratic formula, $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$, can be used to find the solutions to an equation in the form $ax^2 + bx + c = 0$. In the given equation, $a = 6$, $b = 5$, and $c = -7$. Substituting these values into the quadratic formula gives $\frac{-5 \pm \sqrt{5^2-4(6)(-7)}}{2(6)}$, or $\frac{-5 \pm \sqrt{25+168}}{12}$.

Choice B is incorrect and may result from using $\frac{-a \pm \sqrt{b^2-4ac}}{2a}$ as the quadratic formula. Choice C is incorrect and may result from using $\frac{-b \pm \sqrt{a^2+4ac}}{2a}$ as the quadratic formula. Choice D is incorrect and may result from using $\frac{-a \pm \sqrt{a^2+4ac}}{2a}$ as the quadratic formula.

Solving systems of equations in two variables

Question 262d47e

Show Advanced Math - Nonlinear equations in one variable and systems of equations in two variables

$$x^2 + y + 7 = 7$$

$$20x + 100 - y = 0$$

The solution to the given system of equations is (x, y). What is the value of x?

Answer

The correct answer is -10. Adding y to both sides of the second equation in the given system yields $20x + 100 = y$. Substituting $20x + 100$ for y in the first equation in the given system yields $x^2 + 20x + 100 + 7 = 7$. Subtracting 7 from both sides of this equation yields $x^2 + 20x + 100 = 0$. Factoring the left-hand side of this equation yields $(x + 10)(x + 10) = 0$, or $(x + 10)^2 = 0$. Taking the square root of both sides of this equation yields $x + 10 = 0$. Subtracting 10 from both sides of this equation yields $x = -10$. Therefore, the value of x is -10.

Question 1d4f9e0d

Show Advanced Math - Nonlinear equations in one variable and systems of equations in two variables

In the *xy*-plane, a line with equation $2y = c$ for some constant c intersects a parabola at exactly one point. If the parabola has equation $y = -2x^2 + 9x$, what is the value of c?

Answer

The correct answer is $\frac{81}{4}$. The given linear equation is $2y = c$. Dividing both sides of this equation by 2 yields $y = \frac{c}{2}$. Substituting $\frac{c}{2}$ for y in the equation of the parabola yields $\frac{c}{2} = -2x^2 + 9x$. Adding $2x^2$ and $-9x$ to both sides of this equation yields $2x^2 - 9x + \frac{c}{2} = 0$. Since it's given that the line and the parabola intersect at exactly one point, the equation $2x^2 - 9x + \frac{c}{2} = 0$ must have exactly one solution. An equation of the form $Ax^2 + Bx + C = 0$, where A, B, and C are constants, has exactly one solution when the discriminant, $B^2 - 4AC$, is equal to 0. In the equation $2x^2 - 9x + \frac{c}{2} = 0$, where $A = 2$, $B = -9$, and $C = \frac{c}{2}$, the discriminant is $(-9)^2 - 4(2)\left(\frac{c}{2}\right)$. Setting the discriminant equal to 0 yields $(-9)^2 - 4(2)\left(\frac{c}{2}\right) = 0$, or $81 - 4c = 0$. Adding $4c$ to both sides of this equation yields $81 = 4c$. Dividing both sides of this equation by 4 yields $c = \frac{81}{4}$. Note that 81/4 and 20.25 are examples of ways to enter a correct answer.

Question 65e9d154

Show Advanced Math - Nonlinear equations in one variable and systems of equations in two variables

$x-y=1$
$x+y=x^2-3$

Which ordered pair is a solution to the system of equations above?

- $(1+\sqrt{3}, \sqrt{3})$
- $(\sqrt{3}, -\sqrt{3})$
- $(1+\sqrt{5}, \sqrt{5})$
- $(\sqrt{5}, -1+\sqrt{5})$

Choice A is correct. The solution to the given system of equations can be found by solving the first equation for x, which gives $x=y+1$, and substituting that value of x into the second equation which gives $y+1+y=(y+1)^2-3$. Rewriting this equation by adding like terms and expanding $(y+1)^2$ gives $2y+1=y^2+2y-2$. Subtracting $2y$ from both sides of this equation gives $1=y^2-2$. Adding to 2 to both sides of this equation gives $3=y^2$. Therefore, it follows that $y=\pm\sqrt{3}$. Substituting $\sqrt{3}$ for y in the first equation yields $x-\sqrt{3}=1$. Adding $\sqrt{3}$ to both sides of this equation yields $x=1+\sqrt{3}$. Therefore, the ordered pair $(1+\sqrt{3}, \sqrt{3})$ is a solution to the given system of equations.

Choice B is incorrect. Substituting $\sqrt{3}$ for x and $-\sqrt{3}$ for y in the first equation yields $\sqrt{3}-(-\sqrt{3})=1$, or $2\sqrt{3}=1$, which isn't a true statement. Choice C is incorrect. Substituting $1+\sqrt{5}$ for x and $\sqrt{5}$ for y in the second equation yields $(1+\sqrt{5})+\sqrt{5}=(1+\sqrt{5})^2-3$, or $1+2\sqrt{5}=2\sqrt{5}+3$, which isn't a true statement. Choice D is incorrect. Substituting $\sqrt{5}$ for x and $(-1+\sqrt{5})$ for y in the second equation yields $\sqrt{5}+(-1+\sqrt{5})=(\sqrt{5})^2-3$, or $2\sqrt{5}-1=2$, which isn't a true statement.

Question 67c08ea4

Show Advanced Math - Nonlinear equations in one variable and systems of equations in two variables

$x+y=17$
$xy=72$

If one solution to the system of equations above is (x,y), what is one possible value of x ?

Answer

The correct answer is either 8 or 9. The first equation can be rewritten as $y=17-x$. Substituting $17-x$ for y in the second equation gives $x(17-x)=72$. By applying the distributive property, this can be rewritten as $17x-x^2=72$. Subtracting 72 from both sides of the equation yields $x^2-17x+72=0$. Factoring the left-hand side of this equation yields $(x-8)(x-9)=0$. Applying the Zero Product Property, it follows that $x-8=0$ and $x-9=0$. Solving each equation for x yields $x=8$ and $x=9$ respectively. Note that 8 and 9 are examples of ways to enter a correct answer.

Question 1cdfc27

Show Advanced Math - Nonlinear functions

$$f(x) = 4{,}000(0.75)^x$$

An entomologist recommended a program to reduce a certain invasive beetle population in an area. The given function estimates this beetle species' population x years after 2012, where $x \leq 7$. Which of the following is the best interpretation of $4{,}000$ in this context?

- The estimated initial beetle population for this species and area in 2012
- The estimated beetle population for this species and area 7 years after 2012
- The estimated percent decrease in the beetle population for this species and area each year after 2012
- The estimated percent decrease in the beetle population for this species and area every 7 years after 2012

Choice A is correct. For an exponential function in the form $f(x) = a(b)^x$, where a and b are positive constants and $b < 1$, the initial value of $f(x)$, or the value of $f(x)$ when $x = 0$, is a and the value of $f(x)$ decreases by $100(1 - b)\%$ each time x increases by 1. Therefore, the initial value of the function $f(x) = 4{,}000(0.75)^x$, or the value of $f(x)$ when $x = 0$, is $4{,}000$. Therefore, the best interpretation of $4{,}000$ in this context is the estimated initial beetle population for this species and area in 2012.

Choice B is incorrect. The estimated beetle population for this species and area 7 years after 2012 is $4{,}000(0.75)^7$, or approximately 534, not $4{,}000$.

Choice C is incorrect. The estimated percent decrease in the beetle population for this species and area each year after 2012 is $100(1 - 0.75)$, or 25, not $4{,}000$.

Choice D is incorrect. The estimated percent decrease in the beetle population for this species and area every 7 years after 2012 is $100\left(1 - 0.75^7\right)$, or approximately 87, not $4{,}000$.

Question 664c858

Show Advanced Math - Nonlinear functions

The area of a triangle is 270 square centimeters. The length of the base of the triangle is 12 centimeters greater than the height of the triangle. What is the height, in centimeters, of the triangle?

- 15
- 18
- 30
- 36

Choice B is correct. The area, A, of a triangle is given by the formula $A = \frac{1}{2}bh$, where b represents the length of the base of the triangle and h represents its height. It's given that the area of a triangle is 270 square centimeters and that the length of the base of this triangle is 12 centimeters greater than the height of the triangle. Let x represent the height, in centimeters, of the triangle. It follows that the length of the base of the triangle can be expressed as $x + 12$. Substituting 270 for A, x for h, and $x + 12$ for b in the formula $A = \frac{1}{2}bh$ yields $270 = \frac{1}{2}(x + 12)(x)$, or $270 = \frac{1}{2}x(x + 12)$. Multiplying both sides of this equation by 2 yields $540 = x(x + 12)$. Applying the distributive property on the right-hand side of this equation yields $540 = x^2 + 12x$. Subtracting 540 from both sides of this equation yields $0 = x^2 + 12x - 540$. In factored form, this equation is equivalent to $(x + 30)(x - 18) = 0$. Applying the zero product property, it follows that $x + 30 = 0$ or $x - 18 = 0$. Subtracting 30 from both sides of the equation $x + 30 = 0$ yields $x = -30$. Adding 18 to both sides of the equation $x - 18 = 0$ yields $x = 18$. Since x represents the height of the triangle, it must be positive. Therefore, the height, in centimeters, of the triangle is 18.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

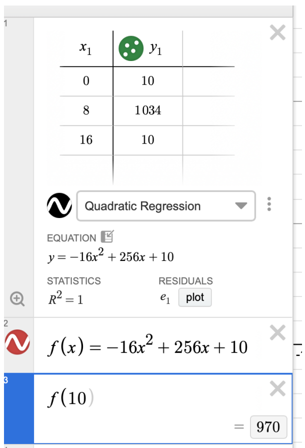
Choice D is incorrect and may result from conceptual or calculation errors.

Question 95e390e

Show Advanced Math - Nonlinear functions

A quadratic function models the height, in feet, of an object above the ground in terms of the time, in seconds, after the object is launched off an elevated surface. The model indicates the object has an initial height of 10 feet above the ground and reaches its maximum height of $1{,}034$ feet above the ground 8 seconds after being launched. Based on the model, what is the height, in feet, of the object above the ground 10 seconds after being launched?

- 234
- 778
- 970
- 1,014



Choice C is correct. It's given that a quadratic function models the height, in feet, of an object above the ground in terms of the time, in seconds, after the object is launched off an elevated surface. This quadratic function can be defined by an equation of the form $f(x) = a(x-h)^2 + k$, where $f(x)$ is the height of the object x seconds after it was launched, and a, h, and k are constants such that the function reaches its maximum value, k, when $x = h$. Since the model indicates the object reaches its maximum height of $1{,}034$ feet above the ground 8 seconds after being launched, $f(x)$ reaches its maximum value, $1{,}034$, when $x = 8$. Therefore, $k = 1{,}034$ and $h = 8$. Substituting 8 for h and $1{,}034$ for k in the function $f(x) = a(x-h)^2 + k$ yields $f(x) = a(x-8)^2 + 1{,}034$. Since the model indicates the object has an initial height of 10 feet above the ground, the value of $f(x)$ is 10 when $x = 0$. Substituting 0 for x and 10 for $f(x)$ in the equation $f(x) = a(x-8)^2 + 1{,}034$ yields $10 = a(0-8)^2 + 1{,}034$, or $10 = 64a + 1{,}034$. Subtracting $1{,}034$ from both sides of this equation yields $64a = -1{,}024$. Dividing both sides of this equation by 64 yields $a = -16$. Therefore, the model can be represented by the equation $f(x) = -16(x-8)^2 + 1{,}034$. Substituting 10 for x in this equation yields $f(10) = -16(10-8)^2 + 1{,}034$, or $f(10) = 970$. Therefore, based on the model, 10 seconds after being launched, the height of the object above the ground is 970 feet.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

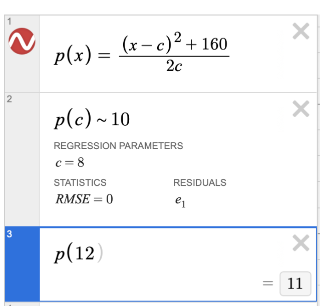
Choice D is incorrect and may result from conceptual or calculation errors.

Question b76bb67

Show Advanced Math - Nonlinear functions

Let the function p be defined as $p(x) = \frac{(x-c)^2+160}{2c}$, where c is a constant. If $p(c) = 10$, what is the value of $p(12)$?

- 10.00
- 10.25
- 10.75
- 11.00



Choice D is correct. The value of p(12) depends on the value of the constant c, so the value of c must first be determined. It is given that p(c) = 10. Based on the definition of p, it follows that:

$p(c) = \frac{(c-c)^2+160}{2c} = 10$

$\frac{160}{2c} = 10$

$2c = 16$

$c = 8$

This means that $p(x) = \frac{(x-8)^2+160}{16}$ for all values of x.

Therefore:

$p(12) = \frac{(12-8)^2+160}{16}$

$= \frac{16+160}{16}$

$= 11$

Choice A is incorrect. It is the value of p(8), not p(12). Choices B and C are incorrect. If one of these values were correct, then x = 12 and the selected value of p(12) could be substituted into the equation to solve for c. However, the values of c that result from choices B and C each result in p(c) < 10.

Question 30703968

Show Advanced Math - Nonlinear functions

Function f is a quadratic function where $f(-20) = 0$ and $f(-4) = 0$. The graph of $y = f(x)$ in the *xy*-plane has a vertex at $(r, -64)$. What is the value of r?

Answer

The correct answer is -12. It's given that function f is a quadratic function where $f(-20) = 0$ and $f(-4) = 0$. It follows that the graph of $y = f(x)$ in the *xy*-plane passes through the points $(-20, 0)$ and $(-4, 0)$. When the graph of a quadratic function contains two points $(a, 0)$ and $(b, 0)$, the *x*-coordinate of the vertex of the graph is the average of a and b. Therefore, the *x*-coordinate of the vertex of the graph of $y = f(x)$ is $\frac{-20+(-4)}{2}$, or -12. It's given that the graph of $y = f(x)$ in the *xy*-plane has a vertex at $(r, -64)$. It follows that the value of r is -12.

Question 66a6b2f9

Show Advanced Math - Nonlinear functions

There were no jackrabbits in Australia before 1788 when 24 jackrabbits were introduced. By 1920 the population of jackrabbits had reached 10 billion. If the population had grown exponentially, this would correspond to a 16.2% increase, on average, in the population each year. Which of the following functions best models the population $p(t)$ of jackrabbits t years after 1788?

- $p(t) = 1.162(24)^t$
- $p(t) = 24(2)^{1.162t}$
- $p(t) = 24(1.162)^t$
- $p(t) = (24 \cdot 1.162)^t$

Choice C is correct. This exponential growth model can be written in the form $p(t) = A(1 + r)^t$, where $p(t)$ is the population t years after 1788, A is the initial population, and r is the yearly growth rate, expressed as a decimal. Since there were 24 jackrabbits in Australia in 1788, $A = 24$. Since the number of jackrabbits increased by an average of 16.2% each year, $r = 0.162$. Therefore, the equation that best models this situation is $p(t) = 24(1.162)^t$.

Choices A, B, and D are incorrect and may result from misinterpreting the form of an exponential growth model.

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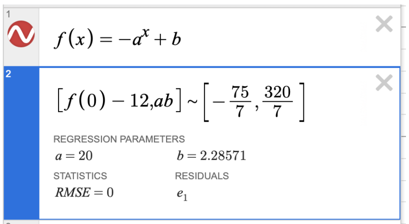
Question 92ae7544

Show Advanced Math - Nonlinear functions

Function f is defined by $f(x) = -a^x + b$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x) - 12$ has a *y*-intercept at $\left(0, -\frac{75}{7}\right)$. The product of a and b is $\frac{320}{7}$. What is the value of a?

Answer



The correct answer is 20. It's given that $f(x) = -a^x + b$. Substituting $-a^x + b$ for $f(x)$ in the equation $y = f(x) - 12$ yields $y = -a^x + b - 12$. It's given that the *y*-intercept of the graph of $y = f(x) - 12$ is $\left(0, -\frac{75}{7}\right)$. Substituting 0 for x and $-\frac{75}{7}$ for y in the equation $y = -a^x + b - 12$ yields $-\frac{75}{7} = -a^0 + b - 12$, which is equivalent to $-\frac{75}{7} = -1 + b - 12$, or $-\frac{75}{7} = b - 13$. Adding 13 to both sides of this equation yields $\frac{16}{7} = b$. It's given that the product of a and b is $\frac{320}{7}$, or $ab = \frac{320}{7}$. Substituting $\frac{16}{7}$ for b in this equation yields $(a)\left(\frac{16}{7}\right) = \frac{320}{7}$. Dividing both sides of this equation by $\frac{16}{7}$ yields $a = 20$.

Question 94b5bb4b

Show Advanced Math - Nonlinear functions

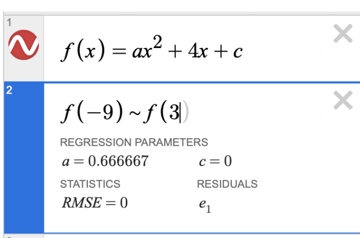
$$f(x) = ax^2 + 4x + c$$

In the given quadratic function, a and c are constants. The graph of $y = f(x)$ in the *xy*-plane is a parabola that opens upward and has a vertex at the point (h, k), where h and k are constants. If $k < 0$ and $f(-9) = f(3)$, which of the following must be true?

I. $c < 0$

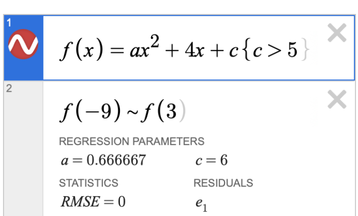
II. $a \geq 1$

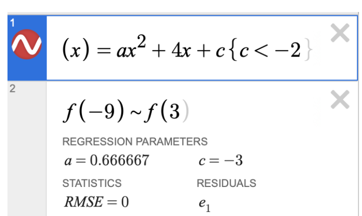
- I only
- II only
- I and II
- Neither I nor II



Choice D is correct. It's given that the graph of $y = f(x)$ in the *xy*-plane is a parabola with vertex (h, k). If $f(-9) = f(3)$, then for the graph of $y = f(x)$, the point with an *x*-coordinate of -9 and the point with an *x*-coordinate of 3 have the same *y*-coordinate. In the *xy*-plane, a parabola is a symmetric graph such that when two points have the same *y*-coordinate, these points are equidistant from the vertex, and the *x*-coordinate of the vertex is halfway between the *x*-coordinates of these two points. Therefore, for the graph of $y = f(x)$, the points with *x*-coordinates -9 and 3 are equidistant from the vertex, (h, k), and h is halfway between -9 and 3. The value that is halfway between -9 and 3 is $\frac{-9+3}{2}$, or -3. Therefore, $h = -3$. The equation defining f can also be written in vertex form, $f(x) = a(x-h)^2 + k$. Substituting -3 for h in this equation yields $f(x) = a(x-(-3))^2 + k$, or $f(x) = a(x+3)^2 + k$. This equation is equivalent to $f(x) = a(x^2 + 6x + 9) + k$, or $f(x) = ax^2 + 6ax + 9a + k$. Since $f(x) = ax^2 + 4x + c$, it follows that $6a = 4$ and $9a + k = c$. Dividing both sides of the equation $6a = 4$ by 6 yields $a = \frac{4}{6}$, or $a = \frac{2}{3}$. Since $\frac{2}{3} < 1$, it's not true that $a \geq 1$. Therefore, statement II isn't true. Substituting $\frac{2}{3}$ for a in the equation $9a + k = c$ yields $9\left(\frac{2}{3}\right) + k = c$, or $6 + k = c$. Subtracting 6 from both sides of this equation yields $k = c - 6$. If $k < 0$, then $c - 6 < 0$, or $c < 6$. Since c could be any value less than 6, it's not necessarily true that $c < 0$. Therefore, statement I isn't necessarily true. Thus, neither I nor II must be true.

Note that this is a little dangerous, because c could be lots of things.





Question a44345a

Geometry and Trigonometry - Area and volume

2/39

Show

Parallelogram $ABCD$ is similar to parallelogram $PQRS$. The length of each side of parallelogram $PQRS$ is 2 times the length of its corresponding side of parallelogram $ABCD$. The area of parallelogram $ABCD$ is 5 square centimeters. What is the area, in square centimeters, of parallelogram $PQRS$?

- 7
- 10
- 20
- 25

Choice C is correct. It's given that parallelogram $ABCD$ is similar to parallelogram $PQRS$. When two parallelograms are similar, if the scale factor between their corresponding side lengths is k, the scale factor between their areas is k^2. It's given that the length of each side of parallelogram $PQRS$ is 2 times the length of its corresponding side of parallelogram $ABCD$, so the scale factor between their corresponding side lengths is 2. It follows that the scale factor between their areas is 2^2, or 4. It's given that the area, in square centimeters, of parallelogram $ABCD$ is 5. It follows that the area, in square centimeters, of parallelogram $PQRS$ is $5(4)$, or 20.

Question 20457c16

Geometry and Trigonometry - Area and volume

7/39

Show

A circle has a circumference of 31π centimeters. What is the diameter, in centimeters, of the circle?

Answer

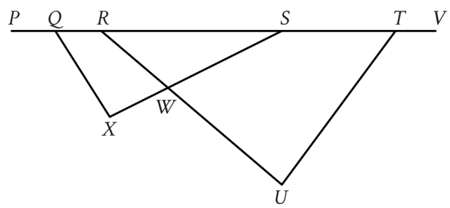
The correct answer is 31. The circumference of a circle is equal to $2\pi r$ centimeters, where r represents the radius, in centimeters, of the circle, and the diameter of the circle is equal to $2r$ centimeters. It's given that a circle has a circumference of 31π centimeters. Therefore, $31\pi = 2\pi r$. Dividing both sides of this equation by π yields $31 = 2r$. Since the diameter of the circle is equal to $2r$ centimeters, it follows that the diameter, in centimeters, of the circle is 31.

September 10, 2026

Question b2426a45

Geometry and Trigonometry - Lines, angles, and triangles

25/34 Show



Note: Figure not drawn to scale.

In the figure shown, points Q, R, S, and T lie on line segment PV, and line segment RU intersects line segment SX at point W. The measure of $\angle SQX$ is $48°$, the measure of $\angle SXQ$ is $86°$, the measure of $\angle SWU$ is $85°$, and the measure of $\angle VTU$ is $162°$. What is the measure, in degrees, of $\angle TUR$?

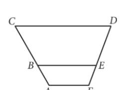
Answer

The correct answer is 123. The triangle angle sum theorem states that the sum of the measures of the interior angles of a triangle is 180 degrees. It's given that the measure of $\angle SQX$ is $48°$ and the measure of $\angle SXQ$ is $86°$. Since points S, Q, and X form a triangle, it follows from the triangle angle sum theorem that the measure, in degrees, of $\angle QSX$ is $180 - 48 - 86$, or 46. It's also given that the measure of $\angle SWU$ is $85°$. Since $\angle SWU$ and $\angle SWR$ are supplementary angles, the sum of their measures is 180 degrees. It follows that the measure, in degrees, of $\angle SWR$ is $180 - 85$, or 95. Since points R, S, and W form a triangle, and $\angle RSW$ is the same angle as $\angle QSX$, it follows from the triangle angle sum theorem that the measure, in degrees, of $\angle WRS$ is $180 - 46 - 95$, or 39. It's given that the measure of $\angle VTU$ is $162°$. Since $\angle VTU$ and $\angle STU$ are supplementary angles, the sum of their measures is 180 degrees. It follows that the measure, in degrees, of $\angle STU$ is $180 - 162$, or 18. Since points R, T, and U form a triangle, and $\angle URT$ is the same angle as $\angle WRS$, it follows from the triangle angle sum theorem that the measure, in degrees, of $\angle TUR$ is $180 - 39 - 18$, or 123.

Question b8bbe611

Geometry and Trigonometry - Lines, angles, and triangles

26/34 Show



In the figure above, $\overline{AF}$, $\overline{BE}$, and $\overline{CD}$ are parallel. Points B and E lie on $\overline{AC}$ and $\overline{FD}$, respectively. If $AB = 9$, $BC = 18.5$, and $FE = 8.5$, what is the length of $\overline{ED}$, to the nearest tenth?

- 16.8
- 17.5
- 18.4
- 19.6

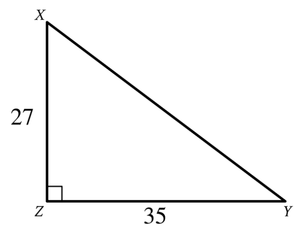
×

Choice B is correct. Since $\overline{AF}$, $\overline{BE}$, and $\overline{CD}$ are parallel, quadrilaterals $AFEB$ and $BEDC$ are similar. Let x represent the length of $\overline{ED}$. With similar figures, the ratios of the lengths of corresponding sides are equal. It follows that $\frac{9}{18.5} = \frac{8.5}{x}$. Multiplying both sides of this equation by 18.5 and by x yields $9x = (18.5)(8.5)$, or $9x = 157.25$. Dividing both sides of this equation by 9 yields $x = 17.47$, which to the nearest tenth is 17.5.

Question 120f3d69

Geometry and Trigonometry - Right triangles and trigonometry

3/23 Show



Note: Figure not drawn to scale.

Triangle XYZ shown is a right triangle. Which of the following has the same value as $\sin X$?

- $\tan X$
- $\tan Y$
- $\cos X$
- $\cos Y$

Choice D is correct. The sine of an angle is equal to the cosine of its complementary angle. In the triangle shown, angle Z is a right angle; thus, angles X and Y are complementary angles. Therefore, $\cos Y$ has the same value as $\sin X$.

Question e362d5ab

Geometry and Trigonometry - Right triangles and trigonometry

21/23 Show

For two acute angles, $\angle Q$ and $\angle R$, $\cos(Q) = \sin(R)$. The measures, in degrees, of $\angle Q$ and $\angle R$ are $x + 61$ and $4x + 4$, respectively. What is the value of x?

- 5
- 19
- 23
- 29

Choice A is correct. It's given that for two acute angles, $\angle Q$ and $\angle R$, $\cos(Q) = \sin(R)$. For two acute angles, if the sine of one angle is equal to the cosine of the other angle, the angles are complementary. It follows that $\angle Q$ and $\angle R$ are complementary. That is, the sum of the measures of the angles is 90 degrees. It's given that the measure of $\angle Q$ is $x + 61$ degrees and the measure of $\angle R$ is $4x + 4$ degrees. It follows that $(x + 61) + (4x + 4) = 90$. By combining like terms, this equation can be rewritten as $5x + 65 = 90$. Subtracting 65 from each side of this equation yields $5x = 25$. Dividing each side of this equation by 5 yields $x = 5$.

Choice B is incorrect. This would be the value of x if $\cos(Q) = \cos(R)$ rather than $\cos(Q) = \sin(R)$.

Choice C is incorrect. This would be the value of x if $\cos(Q) = -\cos(R)$ rather than $\cos(Q) = \sin(R)$ and if $\angle R$ were obtuse rather than acute.

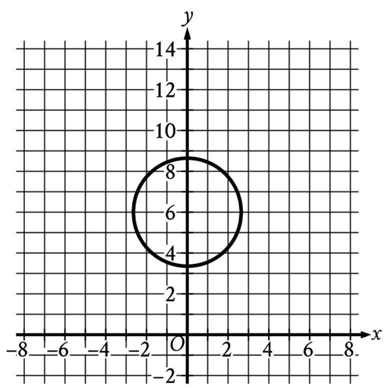
Choice D is incorrect and may result from conceptual or calculation errors.

- **Circles**

Question 1b2b20b9

Geometry and Trigonometry - Circles

1/27 Show



The correct answer is 28. The equation of a circle in the *xy*-plane can be written as $(x-t)^2+(y-s)^2=r^2$, where the center of the circle is (t,s) and the radius of the circle is r. It's given that circle A is defined by the equation $x^2+(y-6)^2=7$, which can be written as $(x-0)^2+(y-6)^2=\left(\sqrt{7}\right)^2$. It follows that $r=\sqrt{7}$ and the radius of circle A is $\sqrt{7}$. It's also given that circle B has the same radius as circle A. If the equation of circle B is $(x-h)^2+(y-k)^2=a$, then $a=r^2$. Substituting $\sqrt{7}$ for r in this equation yields $a=\left(\sqrt{7}\right)^2$, or $a=7$. It follows that the value of $4a$ is $4(7)$, or 28.

Circle A shown is defined by the equation $x^2+(y-6)^2=7$. Circle B (not shown) has the same radius but is translated 96 units to the right. If the equation of circle B is $(x-h)^2+(y-k)^2=a$, where h, k, and a are constants, what is the value of $4a$?

Answer

Question 2855cb58

Geometry and Trigonometry - Circles

3/27 Show

A circle in the *xy*-plane has its center at $(16,17)$ and has a radius of $7k$. Which equation represents this circle?

- $(x-16)^2+(y-17)^2=49k$
- $(x-16)^2+(y-17)^2=49k^2$
- $(x-16)^2+(y-17)^2=7k$
- $(x-16)^2+(y-17)^2=7k^2$

×

Choice B is correct. The equation of a circle in the *xy*-plane can be written as $(x-h)^2+(y-k)^2=r^2$, where the center of the circle is (h,k) and the radius of the circle is r. It's given that this circle has a center at $(16,17)$ and a radius of $7k$. Substituting 16 for h, 17 for k, and $7k$ for r in $(x-h)^2+(y-k)^2=r^2$ yields $(x-16)^2+(y-17)^2=(7k)^2$, or $(x-16)^2+(y-17)^2=49k^2$. Therefore, the equation that represents this circle is $(x-16)^2+(y-17)^2=49k^2$.

Choice A is incorrect. This equation represents a circle with radius $7\sqrt{k}$, not $7k$.

Choice C is incorrect. This equation represents a circle with radius $\sqrt{7k}$, not $7k$.

Choice D is incorrect. This equation represents a circle with radius $\sqrt{7}k$, not $7k$.

Question 74d8b897

Geometry and Trigonometry - Circles

8/27

Show

An angle has a measure of $\frac{9\pi}{20}$ radians. What is the measure of the angle in degrees?

Answer

The correct answer is 81. The measure of an angle, in degrees, can be found by multiplying its measure, in radians, by $\frac{180 \text{ degrees}}{\pi \text{ radians}}$. Multiplying the given angle measure, $\frac{9\pi}{20}$ radians, by $\frac{180 \text{ degrees}}{\pi \text{ radians}}$ yields $\left(\frac{9\pi}{20} \text{ radians}\right)\left(\frac{180 \text{ degrees}}{\pi \text{ radians}}\right)$, which is equivalent to 81 degrees.

Question 35d37640

Geometry and Trigonometry - Circles

5/27

Show

Point F lies on a unit circle in the *xy*-plane and has coordinates $(1, 0)$. Point G is the center of the circle and has coordinates $(0, 0)$. Point H also lies on the circle and has coordinates $(-1, y)$, where y is a constant. Which of the following could be the positive measure of angle FGH, in radians?

- $\frac{27\pi}{2}$
- $\frac{29\pi}{2}$
- 24π
- 25π

Choice D is correct. It's given that the circle is a unit circle, which means the circle has a radius of 1. It's also given that point G is the center of the circle and has coordinates $(0, 0)$ and that point H lies on the circle and has coordinates $(-1, y)$. Since the radius of the circle is 1, the value of y must be 0, as all other points with an *x*-coordinate of -1 are a distance greater than 1 away from point G. Since F and H are points on the unit circle centered at G, let side FG be the starting side of the angle and side GH be the terminal side of the angle. Since side FG is on the positive *x*-axis and side GH is on the negative *x*-axis, side FG is half of a rotation around the unit circle, or π radians, away from side GH. Therefore, the positive measure of angle FGH, in radians, is equal to π plus an integer multiple of 2π. In other words, the positive measure of angle FGH, in radians, is an odd integer multiple of π. Of the given choices, only 25π is an odd integer multiple of π.

Choice A is incorrect. This could be the positive measure of an angle where the starting side is FG and the terminal side contains the point $(0, -1)$, not $(-1, 0)$.

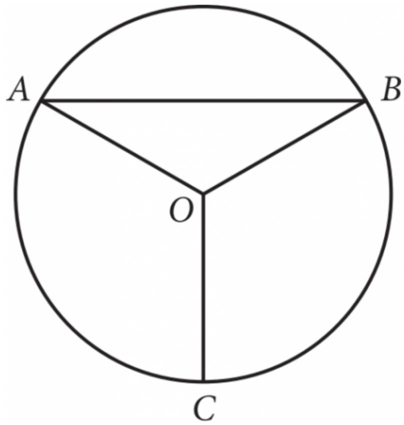
Choice B is incorrect. This could be the positive measure of an angle where the starting side is FG and the terminal side contains the point $(0, 1)$, not $(-1, 0)$.

Choice C is incorrect. This could be the positive measure of an angle where the starting side is FG and the terminal side contains the point $(1, 0)$, not $(-1, 0)$.

Question 69b0d79d

Geometry and Trigonometry - Circles

7/27 Show



Point O is the center of the circle above, and the measure of $\angle OAB$ is $30°$. If the length of $\overline{OC}$ is 18, what is the length of arc $\overset{\frown}{AB}$?

- 9π
- 12π
- 15π
- 18π

Choice B is correct. Because segments OA and OB are radii of the circle centered at point O, these segments have equal lengths. Therefore, triangle AOB is an isosceles triangle, where angles OAB and OBA are congruent base angles of the triangle. It's given that angle OAB measures $30°$. Therefore, angle OBA also measures $30°$. Let $x°$ represent the measure of angle AOB. Since the sum of the measures of the three angles of any triangle is $180°$, it follows that $30° + 30° + x° = 180°$, or $60° + x° = 180°$. Subtracting $60°$ from both sides of this equation yields $x° = 120°$, or $\frac{2\pi}{3}$ radians. Therefore, the measure of angle AOB, and thus the measure of arc $\overset{\frown}{AB}$, is $\frac{2\pi}{3}$ radians. Since $\overline{OC}$ is a radius of the given circle and its length is 18, the length of the radius of the circle is 18. Therefore, the length of arc $\overset{\frown}{AB}$ can be calculated as $\left(\frac{2\pi}{3}\right)(18)$, or 12π.

Question 3e577e4a

Geometry and Trigonometry - Circles

6/27 Show

A circle in the *xy*-plane has its center at $(-4, -6)$. Line k is tangent to this circle at the point $(-7, -7)$. What is the slope of line k?

- -3
- $-\frac{1}{3}$
- $\frac{1}{3}$
- 3

Choice A is correct. A line that's tangent to a circle is perpendicular to the radius of the circle at the point of tangency. It's given that the circle has its center at $(-4, -6)$ and line k is tangent to the circle at the point $(-7, -7)$. The slope of a radius defined by the points (q, r) and (s, t) can be calculated as $\frac{t-r}{s-q}$. The points $(-7, -7)$ and $(-4, -6)$ define the radius of the circle at the point of tangency. Therefore, the slope of this radius can be calculated as $\frac{(-6)-(-7)}{(-4)-(-7)}$, or $\frac{1}{3}$. If a line and a radius are perpendicular, the slope of the line must be the negative reciprocal of the slope of the radius. The negative reciprocal of $\frac{1}{3}$ is -3. Thus, the slope of line k is -3.

Question 82c8325f

Geometry and Trigonometry - Circles

10/27

Show

A circle in the *xy*-plane has its center at $(-4, 5)$ and the point $(-8, 8)$ lies on the circle. Which equation represents this circle?

- $(x-4)^2+(y+5)^2=5$
- $(x+4)^2+(y-5)^2=5$
- $(x-4)^2+(y+5)^2=25$
- $(x+4)^2+(y-5)^2=25$

Choice D is correct. A circle in the *xy*-plane can be represented by an equation of the form $(x-h)^2+(y-k)^2=r^2$, where (h, k) is the center of the circle and r is the length of a radius of the circle. It's given that the circle has its center at $(-4, 5)$. Therefore, $h=-4$ and $k=5$. Substituting -4 for h and 5 for k in the equation $(x-h)^2+(y-k)^2=r^2$ yields $(x-(-4))^2+(y-5)^2=r^2$, or $(x+4)^2+(y-5)^2=r^2$. It's also given that the point $(-8, 8)$ lies on the circle. Substituting -8 for x and 8 for y in the equation $(x+4)^2+(y-5)^2=r^2$ yields $(-8+4)^2+(8-5)^2=r^2$, or $(-4)^2+(3)^2=r^2$, which is equivalent to $16+9=r^2$, or $25=r^2$. Substituting 25 for r^2 in the equation $(x+4)^2+(y-5)^2=r^2$ yields $(x+4)^2+(y-5)^2=25$. Thus, the equation $(x+4)^2+(y-5)^2=25$ represents the circle.

Question 89661424

Geometry and Trigonometry - Circles

12/27

Show

A circle in the *xy*-plane has its center at $(-5, 2)$ and has a radius of 9. An equation of this circle is $x^2+y^2+ax+by+c=0$, where a, b, and c are constants. What is the value of c?

Answer

The correct answer is -52. The equation of a circle in the *xy*-plane with its center at (h, k) and a radius of r can be written in the form $(x-h)^2+(y-k)^2=r^2$. It's given that a circle in the *xy*-plane has its center at $(-5, 2)$ and has a radius of 9. Substituting -5 for h, 2 for k, and 9 for r in the equation $(x-h)^2+(y-k)^2=r^2$ yields $(x-(-5))^2+(y-2)^2=9^2$, or $(x+5)^2+(y-2)^2=81$. It's also given that an equation of this circle is $x^2+y^2+ax+by+c=0$, where a, b, and c are constants. Therefore, $(x+5)^2+(y-2)^2=81$ can be rewritten in the form $x^2+y^2+ax+by+c=0$. The equation $(x+5)^2+(y-2)^2=81$, or $(x+5)(x+5)+(y-2)(y-2)=81$, can be rewritten as $x^2+5x+5x+25+y^2-2y-2y+4=81$. Combining like terms on the left-hand side of this equation yields $x^2+y^2+10x-4y+29=81$. Subtracting 81 from both sides of this equation yields $x^2+y^2+10x-4y-52=0$, which is equivalent to $x^2+y^2+10x+(-4)y+(-52)=0$. This equation is in the form $x^2+y^2+ax+by+c=0$. Therefore, the value of c is -52.