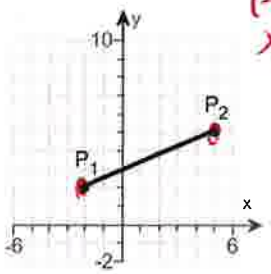
Student: _____ **Instructor:** Alfredo Alvarez **Assignment:**
Date: _____ **Course:** Math 1314 Sullivan Coreq finalm1314COC079sullllljjRZZ12E

1. Find the distance $d(P_1, P_2)$ between the given points P_1 and P_2.

$P_1 = (-2,2)$
$P_2 = (5,5)$



$d(P_1, P_2) =$ [ ]
(Simplify your answer. Type an exact answer, using radicals as needed.)

Answer: $\sqrt{58}$

ID: F.1.21

2. Find the midpoint of the line segment joining the points P_1 and P_2.

$P_1 = (2, -5)$; $P_2 = (6, 7)$

The midpoint of the line segment joining the points P_1 and P_2 is [ ].
(Simplify your answer. Type an ordered pair.)

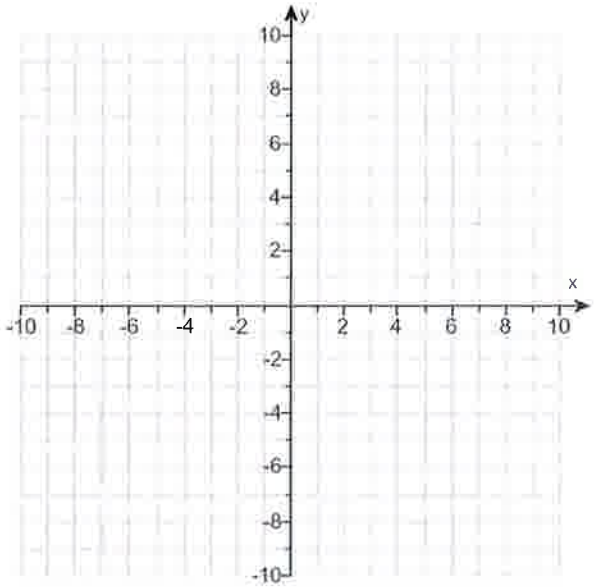
Answer: (4,1)

ID: F.1.39

3.

For the equation $x^2 + y^2 - 4x - 2y - 4 = 0$, do the following.

(a) Find the center (h,k) and radius r of the circle.
(b) Graph the circle.
(c) Find the intercepts, if any.



(a) The center is [ ].
(Type an ordered pair.)

The radius is r = [ ].

(b) Use the graphing tool to graph the circle.

(c) Find the intercepts, if any. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

○ **A.** The intercept(s) is/are [ ].
(Type an ordered pair. Use a comma to separate answers as needed. Type exact answers for each coordinate, using radicals as needed.)

○ **B.** There is no intercept.

Complete the Square

$x^2+y^2-4x-2y-4=0$

$x^2-4x+y^2-2y=4$

$x^2-4x+\left(\frac{1}{2}(-4)\right)^2+y^2-2y+\left(\frac{1}{2}(-2)\right)^2=4+\left(\frac{1}{2}(-4)\right)^2+\left(\frac{1}{2}(-2)\right)^2$

$x^2-4x+(-2)^2+y^2-2y+(-1)^2=4+(-2)^2+(-1)^2$

$x^2-4x+4+y^2-2y+1=4+4+1$

$(x-2)(x-2)+(y-1)(y-1)=9$

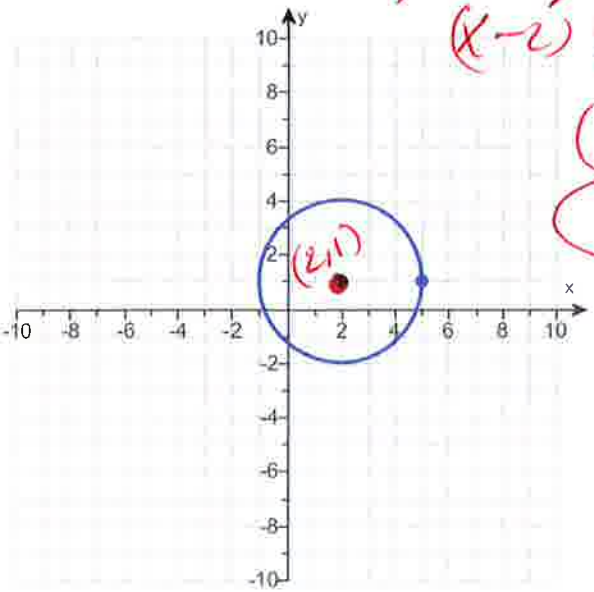
$(x-2)^2+(y-1)^2=9$

CENTER = (2,1) ✓✓

Radius = $\sqrt{9}=3$

Example
EYE Laser
Surgery

Answers (2,1)
3



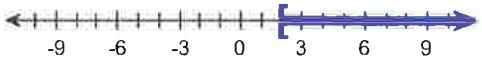
A. The intercept(s) is/are $(2-2\sqrt{2},0),(2+2\sqrt{2},0),(0,1-\sqrt{5}),(0,1+\sqrt{5})$.
(Type an ordered pair. Use a comma to separate answers as needed. Type exact answers for each coordinate, using radicals as needed.)

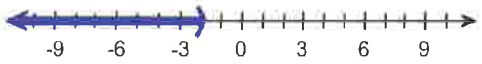
ID: F.4.27

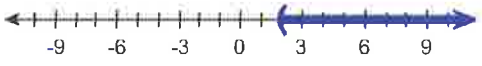
4. Solve the inequality $2 - 3x < -4$. Graph the solution set.

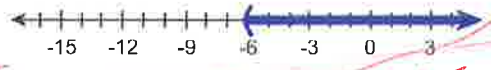
In set notation, the solution is $\{x|$ ____ $\}$. (Type an inequality.)

Graph the solution set. Choose the correct graph below.

A. 

B. 

C. 

D. 

Answers $x > 2$

C. 

ID: 1.1.4

Example 1

$2 - 3x < -4$

$2 - 3x - 2 < -4 - 2$

$-3x < -6$

$\frac{-3x}{-3} > \frac{-6}{-3}$

$x > 2$

$(2, \infty)$

Example 2

$.17 - .015x < .08$

$.17 - .015x - .17 < .08 - .17$

$-.015x < -.09$

$\frac{-.015x}{-.015} > \frac{-.09}{-.015}$

$x > 6$

$(6, \infty)$

DUI

Turn the alligator

Blood Alcohol Content

If BAC is .17 then it will take 6 hours to get to .08

Drive

divide by a negative turn the alligator around

5. Find the following for the function $f(x) = 3x^2 + 2x - 2$.

(a) $f(0)$ **(b)** $f(5)$ **(c)** $f(-5)$ **(d)** $f(-x)$
(e) $-f(x)$ **(f)** $f(x+2)$ **(g)** $f(4x)$ **(h)** $f(x+h)$

(a) $f(0) =$ [ ] (Simplify your answer.)

(b) $f(5) =$ [ ] (Simplify your answer.)

(c) $f(-5) =$ [ ] (Simplify your answer.)

(d) $f(-x) =$ [ ] (Simplify your answer.)

(e) $-f(x) =$ [ ] (Simplify your answer.)

(f) $f(x+2) =$ [ ] (Simplify your answer.)

(g) $f(4x) =$ [ ] (Simplify your answer.)

(h) $f(x+h) =$ [ ] (Simplify your answer.)

Answers -2

83

63

$3x^2 - 2x - 2$

$-3x^2 - 2x + 2$

$3x^2 + 14x + 14$

$48x^2 + 8x - 2$

$3x^2 + 6hx + 3h^2 + 2x + 2h - 2$

ID: 1.1.43

(5) a $f(x) = 3x^2 + 2x - 2$

$f(0) = 3(0)^2 + 2(0) - 2$

$f(0) = 3(0)(0) + 2(0) - 2$

$f(0) = 3(0) + 2(0) - 2$

$f(0) = 0 + 0 - 2$

$f(0) = 0 - 2$

$f(0) = -2$ ✓

(5) b $f(x) = 3x^2 + 2x - 2$

$f(5) = 3(5)^2 + 2(5) - 2$

$f(5) = 3(5)(5) + 2(5) - 2$

$f(5) = 3(25) + 2(5) - 2$

$f(5) = 75 + 10 - 2$

$f(5) = 85 - 2$

$f(5) = 83$ ✓

(5) c $f(x) = 3x^2 + 2x - 2$

$f(-5) = 3(-5)^2 + 2(-5) - 2$

$f(-5) = 3(-5)(-5) + 2(-5) - 2$

$f(-5) = 3(25) + 2(-5) - 2$

$f(-5) = 75 - 10 - 2$

$f(-5) = 64 - 2$

$f(-5) = 63$ ✓

(5) d $f(x) = 3x^2 + 2x - 2$

$f(-x) = 3(-x)^2 + 2(-x) - 2$

$f(-x) = 3(-x)(-x) + 2(-x) - 2$

$f(-x) = 3(x^2) + 2(-x) - 2$

$f(-x) = 3x^2 - 2x - 2$ ✓

(5) e $f(x) = 3x^2 + 2x - 2$

$-f(x) = -(3x^2 + 2x - 2)$

$-f(x) = -3x^2 - 2x + 2$ ✗

(5) f $f(x) = 3x^2 + 2x - 2$

$f(x+2) = 3(x+2)^2 + 2(x+2) - 2$

$f(x+2) = 3(x+2)(x+2) + 2(x+2) - 2$

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

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

$f(x+2) = 3x^2 + 12x + 12 + 2x + 4 - 2$

$f(x+2) = 3x^2 + 14x + 14$ ✓

(5) g $f(x) = 3x^2 + 2x - 2$

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

$f(4x) = 3(4x)(4x) + 2(4x) - 2$

$f(4x) = 3(16x^2) + 2(4x) - 2$

$f(4x) = 48x^2 + 8x - 2$ ✓

(5) h $f(x) = 3x^2 + 2x - 2$

$f(x+h) = 3(x+h)^2 + 2(x+h) - 2$

$f(x+h) = 3(x+h)(x+h) + 2(x+h) - 2$

$f(x+h) = 3(x^2 + 1xh + 1xh + h^2) + 2(x+h) - 2$

$f(x+h) = 3(x^2 + 2xh + h^2) + 2(x+h) - 2$

$f(x+h) = 3x^2 + 6xh + 3h^2 + 2x + 2h - 2$ ✓

6. Find the domain of the function.

$f(x) = \sqrt{6x - 18}$

The domain is [ ]. (Type your answer in interval notation.)

Answer: [3,∞)

ID: 1.1.59

formula domain
$f(x) = \sqrt{Ax+B}$
$Ax+B \geq 0$

$f(x) = \sqrt{6x-18}$

$6x-18 \geq 0$

$6x-18+18 \geq 0+18$

$6x \geq 18$

$\frac{6x}{6} \geq \frac{18}{6}$

$x \geq 3$

$[3, \infty)$

7. For the given functions f and g, complete parts (a)-(h). For parts (a)-(d), also find the domain.

$f(x) = 2x + 1$; $g(x) = 5x - 4$

(a) Find $(f+g)(x)$.

$(f+g)(x) =$ _____ (Simplify your answer.)

What is the domain of $f+g$? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|$ _____ $\}$.
  (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain is $\{x|\ x$ is any real number$\}$.

(b) Find $(f-g)(x)$.

$(f-g)(x) =$ _____ (Simplify your answer.)

What is the domain of $f-g$? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|$ _____ $\}$.
  (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain is $\{x|\ x$ is any real number$\}$.

(c) Find $(f \cdot g)(x)$.

$(f \cdot g)(x) =$ _____ (Simplify your answer.)

What is the domain of $f \cdot g$? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|$ _____ $\}$.
  (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain is $\{x|\ x$ is any real number$\}$.

(d) Find $\left(\frac{f}{g}\right)(x)$.

$\left(\frac{f}{g}\right)(x) =$ _____ (Simplify your answer.)

What is the domain of $\frac{f}{g}$? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|$ _____ $\}$.
  (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain is $\{x|\ x$ is any real number$\}$.

(e) Find $(f+g)(2)$.

$(f+g)(x) = 7x - 3$

$(f+g)(2) = 7(2) - 3$

$(f+g)(3) = 14 - 3$

$(f+g)(3) = 11$

$(f+g)(2) =$ [ ] (Type an integer or a simplified fraction.)

(f) Find $(f-g)(4)$.

$(f-g)(4) =$ [ ] (Type an integer or a simplified fraction.)

(g) Find $(f \cdot g)(3)$.

$(f \cdot g)(3) =$ [ ] (Type an integer or a simplified fraction.)

(h) Find $\left(\frac{f}{g}\right)(1)$.

$\left(\frac{f}{g}\right)(1) =$ [ ] (Type an integer or a simplified fraction.)

Answers $7x-3$

B. The domain is {x| x is any real number}.

$-3x+5$

B. The domain is {x| x is any real number}.

$10x^2-3x-4$

B. The domain is {x| x is any real number}.

$\frac{2x+1}{5x-4}$

A. The domain is $\left\{x \middle| x \neq \frac{4}{5}\right\}$.

(Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

11

-7

77

3

ID: 1.1.67

$(f-g)(x) = -3x+5$

$(f-g)(4) = -3(4)+5$

$(f-g)(4) = -12+5$

$(f-g)(4) = -7$ ✓

$(f \cdot g)(x) = 10x^2-3x-4$

$(f \cdot g)(3) = 10(3)^2-3(3)-4$

$(f \cdot g)(3) = 10(3)(3)-3(3)-4$

$(f \cdot g)(3) = 10(9)-3(3)-4$

$(f \cdot g)(3) = 90-9-4$

$(f \cdot g)(3) = 81-4$

$(f \cdot g)(3) = 77$ ✓

$\left(\frac{f}{g}\right)(x) = \frac{2x+1}{5x-4}$

$\left(\frac{f}{g}\right)(1) = \frac{2(1)+1}{5(1)-4}$

$\left(\frac{f}{g}\right)(1) = \frac{2+1}{5-4}$

$\left(\frac{f}{g}\right)(1) = \frac{3}{1}$

$\left(\frac{f}{g}\right)(1) = 3$ ✓ ✓

8. For the given functions f and g, complete parts (a)-(h). For parts (a)-(d), also find the domain.

$f(x) = x - 8;\ g(x) = 9x^2$

(a) Find $(f+g)(x)$.

$(f+g)(x) =$ _____ (Simplify your answer.)

What is the domain of $f+g$? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|$ _____ $\}$.
  (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain is $\{x|\ x$ is any real number$\}$.

(b) Find $(f-g)(x)$.

$(f-g)(x) =$ _____ (Simplify your answer.)

What is the domain of $f-g$? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|$ _____ $\}$.
  (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain is $\{x|\ x$ is any real number$\}$.

(c) Find $(f \cdot g)(x)$.

$(f \cdot g)(x) =$ _____ (Simplify your answer.)

What is the domain of $f \cdot g$? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|$ _____ $\}$.
  (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain is $\{x|\ x$ is any real number$\}$.

(d) Find $\left(\frac{f}{g}\right)(x)$.

$\left(\frac{f}{g}\right)(x) =$ _____ (Simplify your answer.)

What is the domain of $\frac{f}{g}$? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|$ _____ $\}$.
  (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain is $\{x|\ x$ is any real number$\}$.

(e) Find $(f+g)(3)$.

$(f+g)(x) = f(x) + g(x) = (x-8) + (9x^2) = x - 8 + 9x^2 = 9x^2 + x - 8$ ✓ Domain $(-\infty, \infty)$

$(f-g)(x) = f(x) - g(x) = (x-8) - (9x^2) = x - 8 - 9x^2 = -9x^2 + x - 8$ ✓ Domain $(-\infty, \infty)$

$(f \cdot g)(x) = f(x) \cdot g(x) = (x-8)(9x^2) = 9x^3 - 72x^2 =$ ✓ Domain $(-\infty, \infty)$

$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{x-8}{9x^2} =$ ✓ Set $9x^2 = 0$; $\frac{9x^2}{9} = \frac{0}{9}$; $x^2 = 0$; $\sqrt{x^2} = \sqrt{0}$; $x = 0$; Domain $x \neq 0$

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

$(f+g)(3) = 9(3)^2 + (3) - 8$
$(f+g)(3) = 9(3)(3) + (3) - 8$
$(f+g)(3) = 9(9) + (3) - 8$
$(f+g)(3) = 81 + 3 - 8$
$(f+g)(3) = 76$ ✓

$(f+g)(3) =$ _____ (Type an integer or a simplified fraction.)

(f) Find $(f-g)(4)$.

$(f-g)(4) =$ _____ (Type an integer or a simplified fraction.)

(g) Find $(f \cdot g)(2)$.

$(f \cdot g)(2) =$ _____ (Type an integer or a simplified fraction.)

(h) Find $\left(\frac{f}{g}\right)(3)$.

$\left(\frac{f}{g}\right)(3) =$ _____ (Type an integer or a simplified fraction.)

Answers $9x^2 + x - 8$

B. The domain is {x| x is any real number}.

$-9x^2 + x - 8$

B. The domain is {x| x is any real number}.

$9x^3 - 72x^2$

B. The domain is {x| x is any real number}.

$\frac{x-8}{9x^2}$

A. The domain is {x| $x \neq 0$}.

(Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

76

-148

-216

$-\frac{5}{81}$

ID: 1.1.69

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9. Find the difference quotient of f; that is, find $\frac{f(x+h)-f(x)}{h}$, $h \neq 0$, for the following function. Be sure to simplify.

$f(x) = x^2 - 8x + 2$

$\frac{f(x+h)-f(x)}{h} =$ _____

Answer: $2x + h - 8$

ID: 1.1.83

10. Given $f(x) = x^2 - 2x + 2$, find the value(s) for x such that $f(x) = 37$.

The solution set is { }.

Answer: −5,7

ID: 1.1.91

$x^2 - 2x + 2 = 37$

$x^2 - 2x + 2 - 37 = 0$

factor

$x^2 - 2x - 35 = 0$

$(x + 5)(x - 7) = 0$

$x + 5 = 0$ OR $x - 7 = 0$

$x + 5 - 5 = 0 - 5$ OR $x - 7 + 7 = 0 + 7$

$x = -5$ OR $x = 7$

OR

use Quadratic formula

$1x^2 - 2x - 35 = 0$

$a = 1, b = -2, c = -35$

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

$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-35)}}{2(1)}$

$x = \frac{2 \pm \sqrt{4 + 140}}{2}$

$x = \frac{2 \pm \sqrt{144}}{2}$

$x = \frac{2 \pm 12}{2}$

$x = \frac{2}{2} \pm \frac{12}{2}$

$x = 1 \pm 6$

$x = 1 - 6$ OR $x = 1 + 6$

$x = -5$ OR $x = 7$

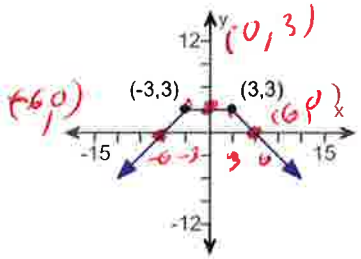
11.

Determine whether the graph is that of a function by using the vertical-line test. If it is, use the graph to find

(a) its domain and range.

(b) the intercepts, if any.

(c) any symmetry with respect to the x-axis, y-axis, or the origin.



Is the graph that of a function?

- (●) Yes
- ( ) No

If the graph is that of a function, what are the domain and range of the function? Select the correct choice below and fill in any answer boxes within your choice.

- (●) **A.** The domain is $(-\infty, \infty)$. The range is $(-\infty, 3]$.
  (Type your answers in interval notation.)
- ( ) **B.** The graph is not a function.

What are the intercepts? Select the correct choice below and fill in any answer boxes within your choice.

- (●) **A.** $(-6, 0)$ $(6, 0)$ $(0, 3)$
  (Type an ordered pair. Use a comma to separate answers as needed.)
- ( ) **B.** There are no intercepts.
- ( ) **C.** The graph is not a function.

Determine if the graph is symmetrical.

- (●) **A.** It is symmetrical with respect to the y-axis.
- ( ) **B.** It is symmetrical with respect to the x-axis.
- ( ) **C.** It is symmetrical with respect to the origin.
- ( ) **D.** The graph is not symmetrical.
- ( ) **E.** The graph is not a function.

Answers Yes

A. The domain is $(-\infty,\infty)$. The range is $(-\infty,3]$. (Type your answers in interval notation.)

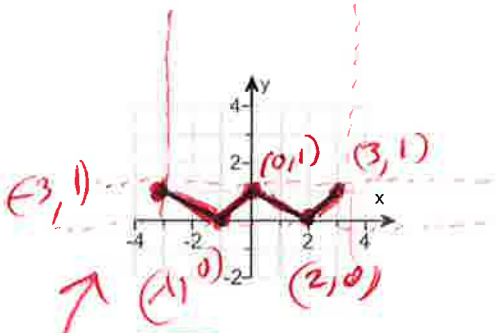
A. $(6,0),(-6,0),(0,3)$ (Type an ordered pair. Use a comma to separate answers as needed.)

A. It is symmetrical with respect to the y-axis.

ID: 1.2.21

12. Using the given graph of the function f, find the following.

(a) the intercepts, if any
(b) its domain and range
(c) the intervals on which it is increasing, decreasing, or constant
(d) whether it is even, odd, or neither



(a) What are the intercepts? x-intercepts y-intercept

(-1,0) (2,0) (0,1)

(Simplify your answer. Type an ordered pair. Use a comma to separate answers as needed.)

(b) The domain is [-3, 3] ← [left, right]

(Type your answer in interval notation.)

The range is [-1, 1] ← [bottom, top]

(Type your answer in interval notation.)

(c) On which interval(s) is the graph increasing? Select the correct choice below and fill in any answer boxes within your choice.

- A. The graph is increasing on [-1, 0] [2, 3]
  (Type your answer in interval notation. Use a comma to separate answers as needed.)
- B. The graph is not increasing on any interval.

On which interval(s) is the graph decreasing? Select the correct choice below and fill in any answer boxes within your choice.

- A. The graph is decreasing on [-3, -1] [0, 2]
  (Type your answer in interval notation. Use a comma to separate answers as needed.)
- B. The graph is not decreasing on any interval.

On which interval(s) is the graph constant? Select the correct choice below and fill in any answer boxes within your choice.

- A. The graph is constant on _____.
  (Type your answer in interval notation. Use a comma to separate answers as needed.)
- B. The graph is not constant on any interval.

(d) The function is (1) _____

(1)
- neither odd nor even.
- odd.
- even.

Favorite Hamburger at 2:38 am on Saturday night

super size it.

TASTE super Great at 2:38 m

Best Cooks work at night!

Answers $(-1,0),(2,0),(0,1)$

$[-3,3]$

$[0,1]$

A. The graph is increasing on $[-1,0],[2,3]$.
(Type your answer in interval notation. Use a comma to separate answers as needed.)

A. The graph is decreasing on $[-3,-1],[0,2]$.
(Type your answer in interval notation. Use a comma to separate answers as needed.)

B. The graph is not constant on any interval.

(1) neither odd nor even.

ID: 1.3.25

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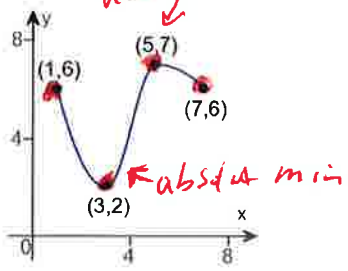
13. For the graph of a function y = f(x) shown to the right, find the absolute maximum and the absolute minimum, if they exist. Identify any local maxima or local minima.



absolute max

absolute min

Example
Weight loss or gain over 7 month period.

Select the correct answer below and, if necessary, fill in the answer boxes to complete your choice.

absolute max

- A. The absolute maximum of y = f(x) is f(5) = 7 or (5, 7)
  (Type integers or simplified fractions.)
- B. There is no absolute maximum for y = f(x).

Select the correct answer below and, if necessary, fill in the answer boxes to complete your choice.

absolute min

- A. The absolute minimum of y = f(x) is f(3) = 2 or (3, 2)
  (Type integers or simplified fractions.)
- B. There is no absolute minimum for y = f(x).

Select the correct answer below and, if necessary, fill in the answer boxes to complete your choice.

local max

- A. The local maximum of y = f(x) is f(5) = 7 or (5, 7)
  (Type integers or simplified fractions.)
- B. The local maxima of y = f(x) are f( ) = and f( ) = .
  (Use ascending order with respect to x. Type integers or simplified fractions.)
- C. There is no local maximum for y = f(x).

Select the correct answer below and, if necessary, fill in the answer boxes to complete your choice.

local min

- A. The local minimum of y = f(x) is f(3) = 2 or (3, 2)
  (Type integers or simplified fractions.)
- B. The local minima of y = f(x) are f( ) = and f( ) = .
  (Use ascending order with respect to x. Type integers or simplified fractions.)
- C. There is no local minimum for y = f(x).

Answers A. The absolute maximum of y = f(x) is f(5) = 7 .(Type integers or simplified fractions.)

A. The absolute minimum of y = f(x) is f(3) = 2 .(Type integers or simplified fractions.)

A. The local maximum of y = f(x) is f(5) = 7 .(Type integers or simplified fractions.)

A. The local minimum of y = f(x) is f(3) = 2 .(Type integers or simplified fractions.)

ID: 1.3.51

14. The function f is defined as follows.

$$f(x) = \begin{cases} -3x + 4 & \text{if } x < 1 \\ 2x - 1 & \text{if } x \geq 1 \end{cases}$$

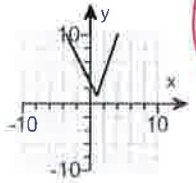
(a) Find the domain of the function.
(b) Locate any intercepts.
(c) Graph the function.
(d) Based on the graph, find the range.

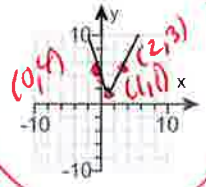
(a) The domain of the function f is $(-\infty, \infty)$ ← (left, right)
(Type your answer in interval notation.)

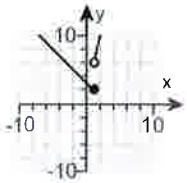
(b) Locate any intercepts. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

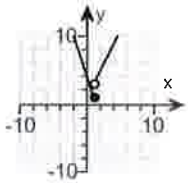
- A. The intercept(s) is/are (0,4) y-intercept
  (Type an ordered pair. Use a comma to separate answers as needed.)
- B. There are no intercepts.

(c) Choose the correct graph below.

A. 

B. 

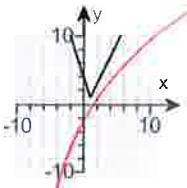
C. 

D. 

(d) The range of the function f is $[1, \infty)$ ← [bottom, TOP)
(Type your answer in interval notation.)

Answers (− ∞,∞)

A. The intercept(s) is/are (0,4).
(Type an ordered pair. Use a comma to separate answers as needed.)

B. 

[1,∞)

$f(x) = \begin{cases} -3x+4 & \text{if } x<1 \\ 2x-1 & \text{if } x \geq 1 \end{cases}$

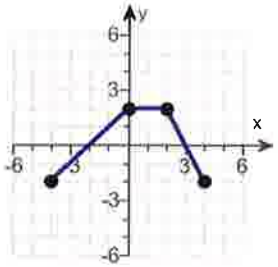
Use graphing calculator

Window
x-min = -12
x-max = 12
y-min = -10
y-max = 10

Little 2ND math
$Y_1 = -3x+4 \div (x<1)$ OPEN circle
2ND MATH
$Y_2 = 2x-1 \div (x \geq 1)$ Closed circle
BIG

ID: 1.4.33

15. The graph of a function f is illustrated to the right. Use the graph of f as the first step toward graphing each of the following functions.



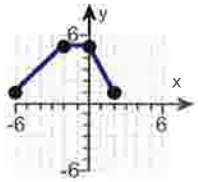
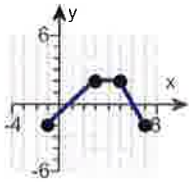
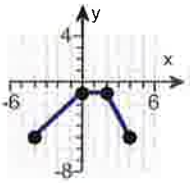
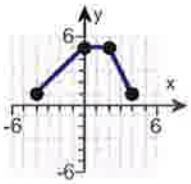
(a) $F(x) = f(x) + 3$ (b) $G(x) = f(x + 3)$ (c) $P(x) = -f(x)$

(d) $H(x) = f(x + 2) - 1$ (e) $Q(x) = \frac{1}{2}f(x)$ (f) $g(x) = f(-x)$

(g) $h(x) = f(2x)$

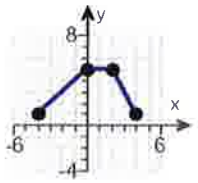
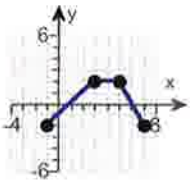
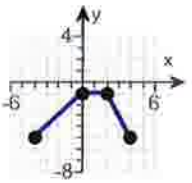
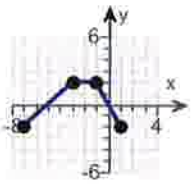
(a) Choose the correct graph of $F(x) = f(x) + 3$ below.

○ A. ○ B. ○ C. ◉ D.

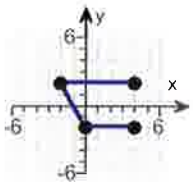
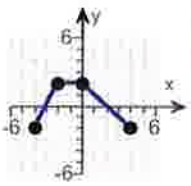
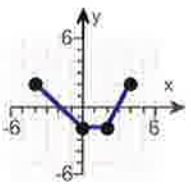
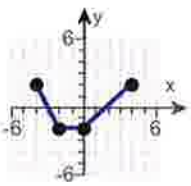
(b) Choose the correct graph of $G(x) = f(x + 3)$ below.

○ A. ○ B. ○ C. ◉ D.

(c) Choose the correct graph of $P(x) = -f(x)$ below.

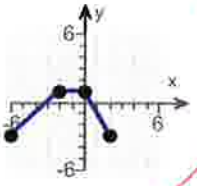
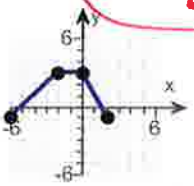
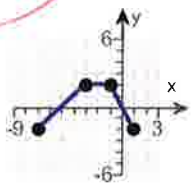
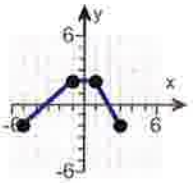
○ A. ○ B. ◉ C. ○ D.

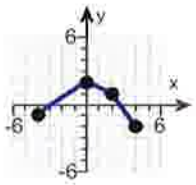
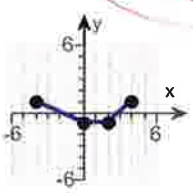
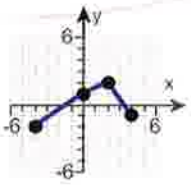
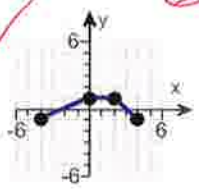
(d) Choose the correct graph of $H(x) = f(x + 2) - 1$ below.

shift left −2 shift down −1

◉ A. ○ B. ○ C. ○ D.

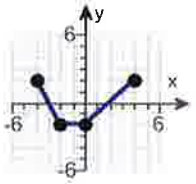
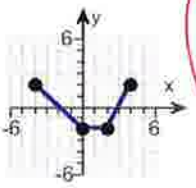
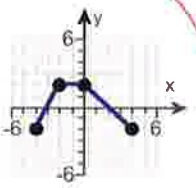
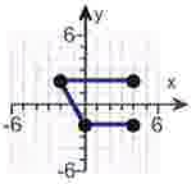





(e) Choose the correct graph of $Q(x) = \frac{1}{2}f(x)$ below.

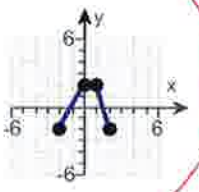
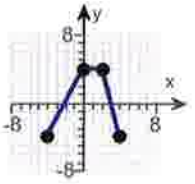
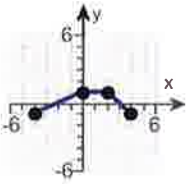
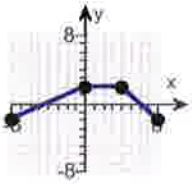
(f) Choose the correct graph of $g(x) = f(-x)$ below.

○ A. ○ B. ○ C. ○ D.

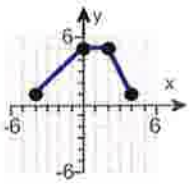





(g) Choose the correct graph of $h(x) = f(2x)$ below.

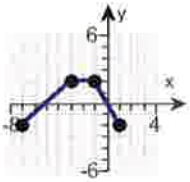
○ A. ○ B. ○ C. ○ D.

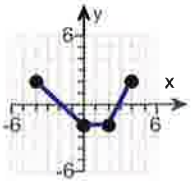
Answers



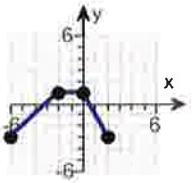
D.



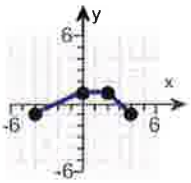
D.



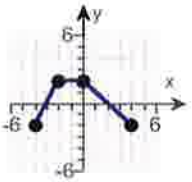
C.



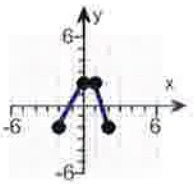
A.



D.



C.



A.

ID: 1.5.63

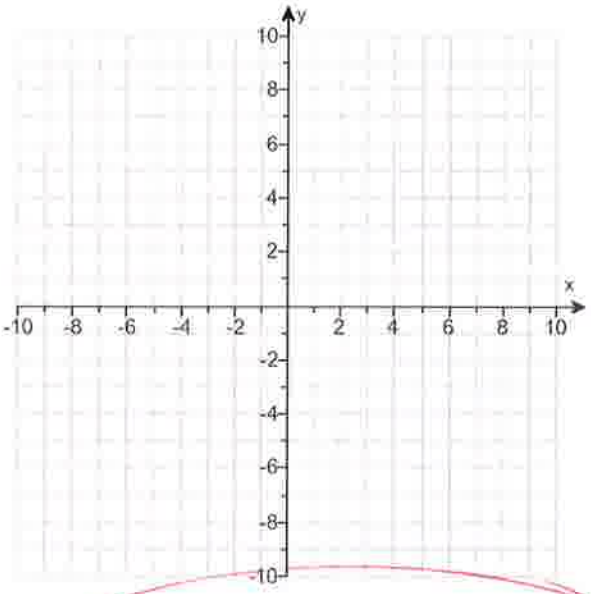
16.

(a) Graph $f(x) = |x - 3| - 4$ using transformations.
(b) Find the area of the region bounded by f and the x-axis that lies below the x-axis.

(a) Graph f(x).

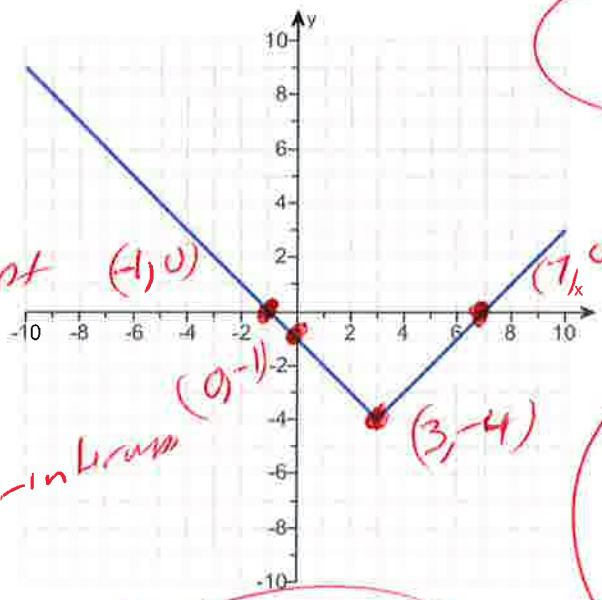
(Use the graphing tool provided to graph the function.)

(b) The area of the region bounded by f and the x-axis that lies below the x-axis is _____ square units.
(Simplify your answer.)



$f(x) = |x-3| - 4$

Answers



x	f(x)
-1	0
0	-1
3	-4
7	0

Use graphing calculators

16

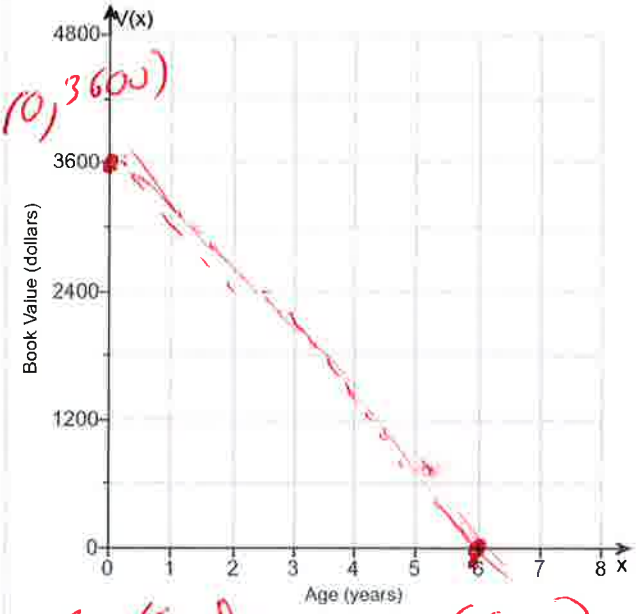
ID: 1.5.81

Window
x-min = -12
x-max = 12
y-min = -10
y-max = 10

y_1 = Math, Num, abs
$y_1 = abs(x - 3) - 4$
B±G B±G
Shift right 3
Shift down -4

17.

Suppose that a company has just purchased a new computer for $3600. The company chooses to depreciate using the straight-line method for 6 years.



(a) Write a linear function that expresses the book value of the computer as a function of its age.

V(x) = ☐

(Type your answer in slope-intercept form.)

(b) What is the implied domain of the function found in part **(a)**?

☐

(Type your answer in interval notation.)

(c) Use the graphing tool to graph the linear equation.

(d) What is the book value of the computer after 5 years?

$ ☐

(Round to the nearest dollar as needed.)

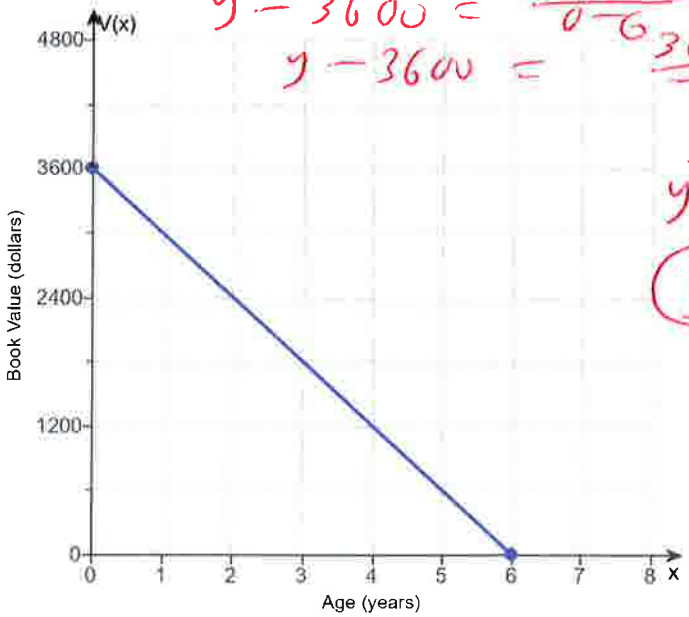
(e) When will the computer be worth $2400?

After ☐ year(s) the computer will be worth $2400.

(Type a whole number.)

Answers $-600x + 3600$

[0,6]



600

2

ID: 2.1.51

18. Find the zeros of the following quadratic function by factoring. What are the x-intercepts of the graph of the function?

$g(x) = x(x + 10) + 24$

Select the correct choice below and fill in the answer box to complete your choice.
(Simplify your answer. Use a comma to separate answers as needed.)

- A. The zeros and the x-intercepts are different. The zeros are _____, the x-intercepts are _____.
- B. The zeros and the x-intercepts are the same. They are _____.

Answer: B. The zeros and the x-intercepts are the same. They are **−4, −6**.

ID: 2.3.23

19. Find the zeros of the quadratic function using the square root method. What are the x-intercepts of the graph of the function?

$g(x) = (x - 1)^2 - 16$

Select the correct choice below and fill in the answer box to complete your choice.
(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

- A. The zeros and the x-intercepts are the same. They are _____.
- B. The zeros and the x-intercepts are different. The zeros are _____, the x-intercepts are _____.

Answer: A. The zeros and the x-intercepts are the same. They are **5, −3**.

ID: 2.3.29

20. Find the zeros, if any, of the quadratic function using the quadratic formula. What are the x-intercepts, if any, of the graph of the function?

$f(x) = 2x^2 + 9 + 10x$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.
(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

- A. The zeros and the x-intercepts are the same. They are _____.
- B. The zeros and the x-intercepts are different. The zeros are _____, the x-intercepts are _____.
- C. There is no real zero solution and no x-intercept.

Answer: A. The zeros and the x-intercepts are the same. They are $\frac{-5+\sqrt{7}}{2}, \frac{-5-\sqrt{7}}{2}$.

ID: 2.3.47

21. Find the real zeros of the function. What are the x-intercepts of the graph of the function?

$g(x) = x + 3\sqrt{x} - 18$

Select the correct choice below and fill in the answer box to complete your choice.

- A. The zeros and the x-intercepts are the same. They are _____.
- B. The zeros and the x-intercepts are different. The zeros are _____, the x-intercepts are _____.

(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

Answer: A. The zeros and the x-intercepts are the same. They are 9.

ID: 2.3.75

(21) part 2 $x^2 - 36x + 324 - 9x = 0$

$x^2 - 45x + 324 = 0$

$(x - 9)(x - 36) = 0$

$x - 9 = 0$ or $x - 36 = 0$

$x - 9 + 9 = 0 + 9$ or $x - 36 + 36 = 0 + 36$

$x = 9$ or ~~$x = 36$~~

check

$x + 3\sqrt{x} - 18 = 0$ Try $x = 9$

$(9) + 3\sqrt{9} - 18 = 0$

$9 + 3(3) - 18 = 0$

$9 + 9 - 18 = 0$

$18 - 18 = 0$

$0 = 0$ Good

$x + 3\sqrt{x} - 18 = 0$ Try ~~$x = 36$~~

$(36) + 3\sqrt{36} - 18 = 0$

$36 + 3(6) - 18 = 0$

$36 + 18 - 18 = 0$

$54 - 18 = 0$

$36 \neq 0$ BAD

answer

$x = 9$

only

22. Find the real zeros of the quadratic function using any method you wish. What are the x-intercepts, if any, of the graph of the function?

$G(x) = 10x^2 - 7x - 12$

Select the correct choice below and fill in the answer box to complete your choice.

- A. The zeros and the x-intercepts are the same. They are _____
- B. The zeros and the x-intercepts are different. The zeros are _____, the x-intercepts are _____.

(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

Answer: A. The zeros and the x-intercepts are the same. They are $-\frac{4}{5}, \frac{3}{2}$

ID: 2.3.81

23. Find the real zeros of the quadratic function using any method you wish. What are the x-intercepts, if any, of the graph of the function?

$f(x) = x^2 + x - 3$

Select the correct choice below and fill in the answer box to complete your choice.

- A. The zeros and the x-intercepts are the same. They are _____.
- B. The zeros and the x-intercepts are different. The zeros are _____, the x-intercepts are _____.

(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

Answer: A. The zeros and the x-intercepts are the same. They are $\frac{-1+\sqrt{13}}{2}, \frac{-1-\sqrt{13}}{2}$.

ID: 2.3.87

24.

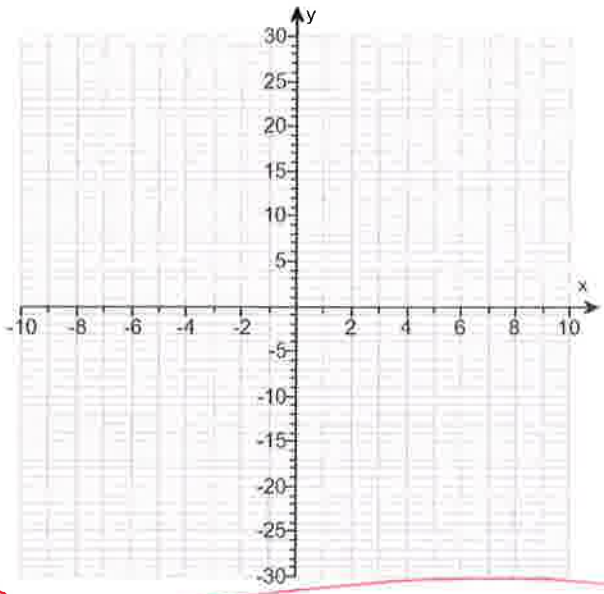
Graph the function $f(x) = -x^2 + 10x$ by starting with the graph of $y = x^2$ and using transformations (shifting, stretching/compressing, and/or reflecting).

Use the graphing tool to graph the function.

Example swimming on Saturday night at 2:30 am in the ocean by yourself.

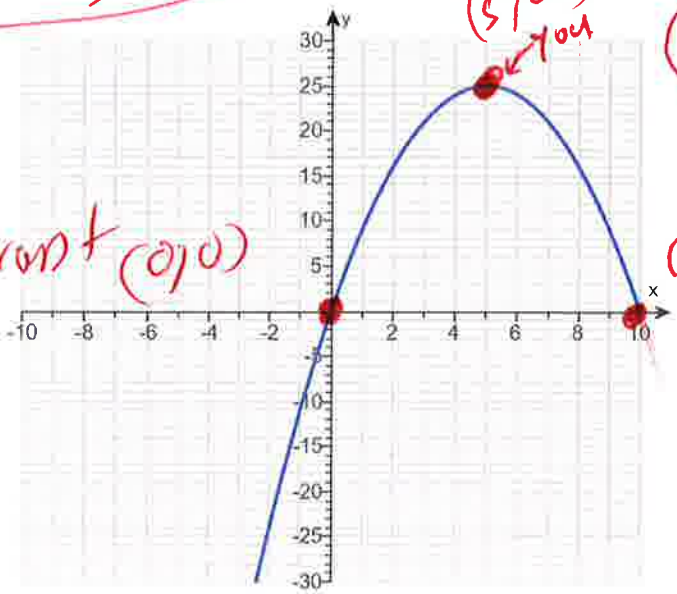
Sharks are always asleep at night

Max vertex



$f(x) = -x^2 + 10x$

Answer:



(5,25) vertex

x-intercept (0,0)

(10,0) x-intercept

x	f(x)
0	0
5	25
10	0

vertex

ID: 2.4.29

Window
X-Min = -12
X-Max = 12
Y-Min = -30
Y-Max = 30

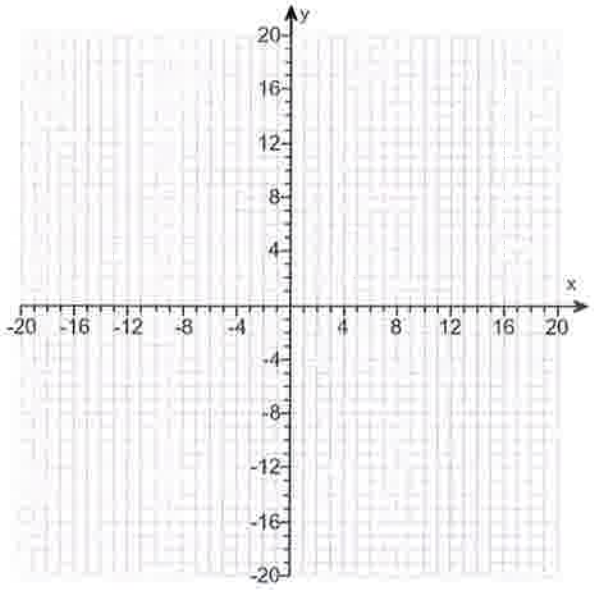
Use graphing calculator

Using $Y_1 = -x^2 + 10x$

SMART Bird 5-8-17

MATH IS FUN

For the quadratic function $f(x) = x^2 + 4x - 12$, answer parts **(a)** through **(c)**.



(a) Graph the quadratic function by determining whether its graph opens up or down and by finding its vertex, axis of symmetry, y-intercept, and x-intercepts, if any.

Does the graph of f open up or down?

- down
- up

What are the coordinates of the vertex?

The vertex of the parabola is _____.
(Type an ordered pair. Use integers or fractions for any numbers in the expression.)

What is the equation of the axis of symmetry?

The axis of symmetry is _____.
(Type an equation.)

What is/are the x-intercept(s)? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The x-intercept(s) is/are _____.
  (Type an integer or a decimal. Use a comma to separate answers as needed.)
- **B.** There are no x-intercepts.

What is the y-intercept? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The y-intercept is _____.
  (Type an integer or a decimal.)
- **B.** There is no y-intercept.

Use the graphing tool to graph the function.

(b) Determine the domain and the range of the function.

The domain of f is _____.
(Type your answer in interval notation.)

The range of f is _____.
(Type your answer in interval notation.)

(c) Determine where the function is increasing and where it is decreasing.

The function is increasing on the interval _____.
(Type your answer in interval notation.)

Good, Sharks sleep at night!

Example swimming in the Sea on Saturday night at 234 am.

Answers up

(−2, −16)

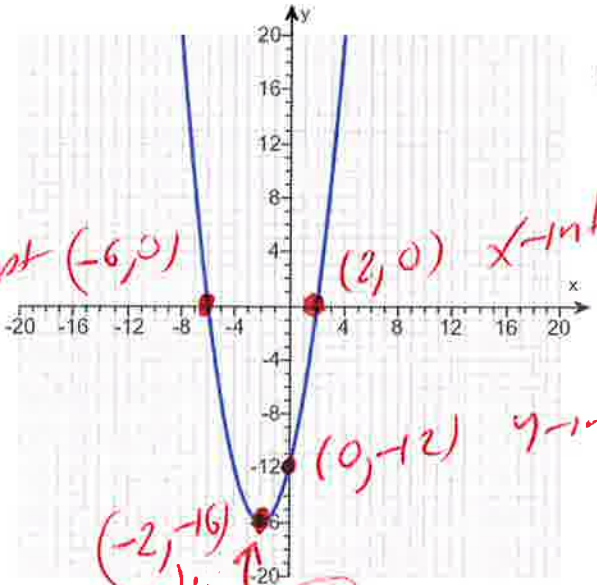
x = −2

A. The x-intercept(s) is/are −6,2.

(Type an integer or a decimal. Use a comma to separate answers as needed.)

A. The y-intercept is −12.(Type an integer or a decimal.)

$f(x) = x^2 + 4x - 12$



x-intercept (−6,0) (2,0) x-intercept

(0,−12) y-intercept

(−2,−16) value min (you)

x	f(x)
−6	0
−2	−16
0	−12
2	0

value

Use graphing calculator

(−∞,∞)

[−16,∞)

[−2,∞)

(−∞,−2]

x-min = −12

x-max = 12

y-min = −20

y-max = 20

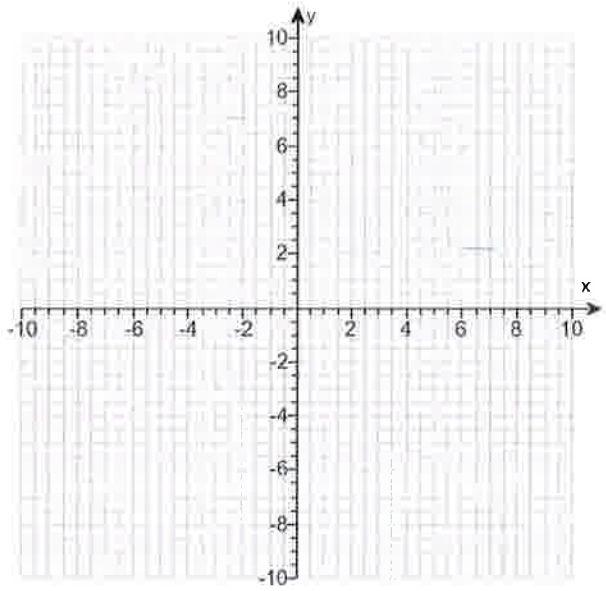
ID: 2.4.37

BIG

$y_1 = x^2 + 4x - 12$

26.

For the quadratic function $f(x) = -2x^2 + 2x - 2$, answer parts **(a)** through **(c)**. Verify the results using a graphing utility.



(a) Graph the quadratic function by determining whether its graph opens up or down and by finding its vertex, axis of symmetry, y-intercept, and x-intercepts, if any.

The graph of f opens (1) ____

The vertex of f is ____.
(Type an ordered pair.)

The axis of symmetry is ____.
(Type an equation. Simplify your answer.)

Determine the y-intercept. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The y-intercept is ____.
  (Type an integer or a decimal.)
- **B.** There is no y-intercept.

Determine the x-intercept(s). Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The x-intercept(s) is/are ____.
  (Type an integer or a decimal rounded to two decimal places as needed. Use a comma to separate answers as needed.)
- **B.** There is no x-intercept.

Use the graphing tool to graph the function.

(b) Determine the domain and the range of the function.

The domain of f is ____.
(Type your answer in interval notation.)

The range of f is ____.
(Type your answer in interval notation.)

(c) Determine where the function is increasing and where it is decreasing.

The function is increasing on the interval ____.
(Type your answer in interval notation.)

The function is decreasing on the interval ____.
(Type your answer in interval notation.)

(1) ○ down.
○ up.

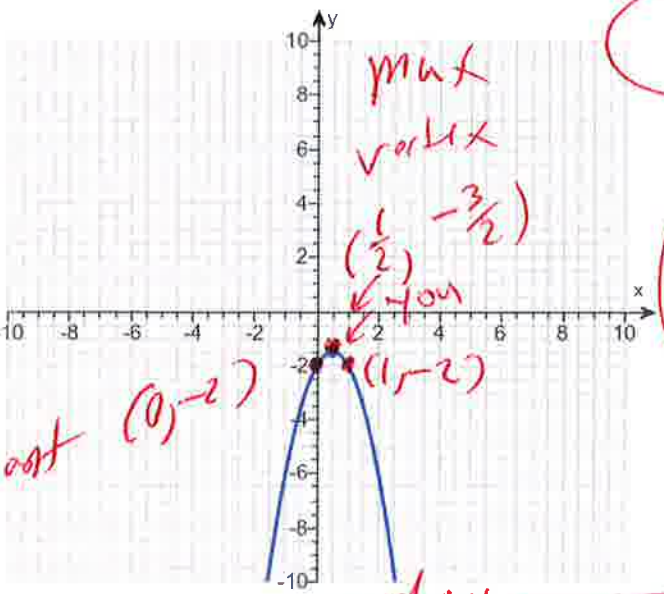
Answers (1) down.

$\left(\frac{1}{2}, -\frac{3}{2}\right)$

$x = \frac{1}{2}$

A. The y-intercept is [−2].(Type an integer or a decimal.)

B. There is no x-intercept.



max vertex $(\frac{1}{2}, -\frac{3}{2})$ down

y-intercept (0, -2)

(1, -2)

$f(x) = -2x^2 + 2x - 2$

use graphing calculator

x	f(x)
0	-2
1/2	-3/2
1	-2

vertex

window

X-min = -12
X-max = 12
y-min = -10
y-max = 10

$(-\infty, \infty)$

$\left(-\infty, -\frac{3}{2}\right]$

$\left(-\infty, \frac{1}{2}\right]$

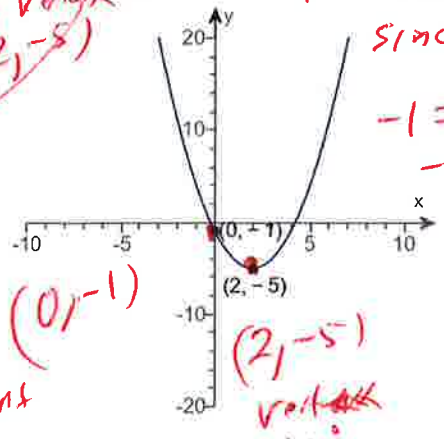
$\left[\frac{1}{2}, \infty\right)$

LIH

$y_1 = -2x^2 + 2x - 2$ B.I.G

ID: 2.4.43

27. Determine the quadratic function whose graph is given below.



Answer: $x^2 - 4x - 1$

The quadratic function which describes the given graph is

f(x) = ____

(Type an expression.)

ID: 2.4.49

28. Determine, without graphing, whether the given quadratic function has a maximum value or a minimum value and then find the value.

$f(x) = -2x^2 + 8x - 4$

Does the quadratic function f have a minimum value or a maximum value?

- The function f has a minimum value.
- The function f has a maximum value.

What is this minimum or maximum value?

____

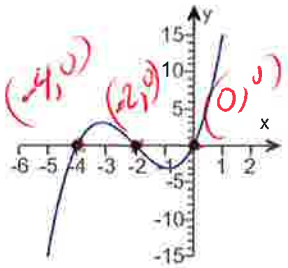
(Simplify your answer.)

Answers The function f has a maximum value.

4

ID: 2.4.59

29. Construct a polynomial function that might have the given graph.



Window
X-min = -12
X-max = 12
y-min = -10
y-max = 10

Choose the correct answer below.

- A. $f(x) = x^2(x-2)(x-4)$
- B. $f(x) = x(x+2)(x+4)$
- C. $f(x) = x^2(x+2)(x+4)$
- D. $f(x) = x(x-2)(x-4)$

Answer: B. $f(x) = x(x+2)(x+4)$

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

$y_1 = x(x+2)(x+4)$

Use Graphing Calculator

ID: 3.1.73

$f(x) = x(x+2)(x+4) = 0$

$x = 0$ OR $x+2 = 0$ OR $x+4 = 0$

$x+2-2 = 0-2$ OR $x+4-4 = 0-4$

$x = -2$ OR $x = -4$

$(0, 0)$, $(-2, 0)$, $(-4, 0)$

OR

$(-4, 0)$, $(-2, 0)$, $(0, 0)$

30. Analyze the polynomial function $f(x) = (x + 1)(x - 5)(x + 6)$ using parts (a) through (e).

(a) Determine the end behavior of the graph of the function.

The graph of f behaves like $y =$ [ ] for large values of $|x|$.

(b) Find the x- and y-intercepts of the graph of the function.

The x-intercept(s) is/are [ ].
(Simplify your answer. Type an integer or a fraction. Use a comma to separate answers as needed. Type each answer only once.)

The y-intercept is [ ].
(Simplify your answer. Type an integer or a fraction.)

(c) Determine the zeros of the function and their multiplicity. Use this information to determine whether the graph crosses or touches the x-axis at each x-intercept.

The zero(s) of f is/are [ ].
(Simplify your answer. Type an integer or a fraction. Use a comma to separate answers as needed. Type each answer only once.)

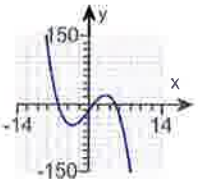
The least zero is a zero of multiplicity [ ], so the graph of f (1) [ ] the x-axis at $x =$ [ ]. The middle zero is a zero of multiplicity [ ], so the graph of f (2) [ ] the x-axis at $x =$ [ ]. The greatest zero is a zero of multiplicity [ ], so the graph of f (3) [ ] the x-axis at $x =$ [ ].

(d) Determine the maximum number of turning points on the graph of the function.

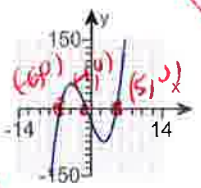
[ ] (Type a whole number.)

(e) Use the above information to draw a complete graph of the function. Choose the correct graph below.

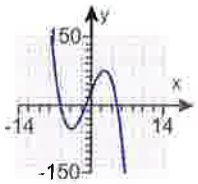
○ A.



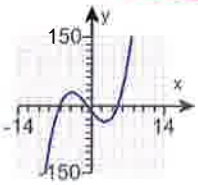
● B.



○ C.



○ D.



(1) ○ crosses ○ touches (2) ○ crosses ○ touches (3) ○ crosses ○ touches

window
X-min = -12
X-max = 12
Y-min = -150
Y-max = 150

use graphing calculator

$f(x) = (x+1)(x-5)(x+6)$

$y_1 = (x+1)(x-5)(x+6)$

$f(x) = (x+1)(x-5)(x+6) = 0$

$x+1 = 0$ or $x-5 = 0$ or $x+6 = 0$

$x+1-1 = 0-1$ or $x-5+5 = 0+5$ or $x+6-6 = 0-6$

$x = -1$ or $x = 5$ or $x = -6$

$(-1, 0)$ or $(5, 0)$ or $(-6, 0)$

$(-6, 0)$ or $(-1, 0)$ or $(5, 0)$

Answers x^3

$-1,5,-6$

-30

$-1,5,-6$

1

(1) crosses

-6

1

(2) crosses

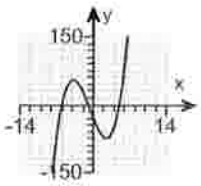
-1

1

(3) crosses

5

2



B.

ID: 3.1.89

31. Analyze the polynomial function $f(x) = x - x^3$. Answer parts **(a)** through **(e)**. [Hint: First factor the polynomial.]

(a) Determine the end behavior of the graph of the function.

The graph of f behaves like y = [ ] for large values of $|x|$.

(b) Find the x- and y-intercepts of the graph of the function.

The x-intercept(s) is/are [ ].
(Type an integer or a simplified fraction. Use a comma to separate answers as needed. Type each answer only once.)

The y-intercept is [ ].
(Type an integer or a simplified fraction.)

(c) Determine the zeros of the function and their multiplicity. Use this information to determine whether the graph crosses or touches the x-axis at each x-intercept.

The zero(s) of f is/are [ ].
(Type an integer or a simplified fraction. Use a comma to separate answers as needed. Type each answer only once.)

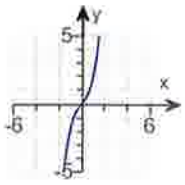
The smallest zero is a zero of multiplicity [ ], so the graph of f (1) [ ] the x-axis at x = [ ]. The middle zero is a zero of multiplicity [ ], so the graph of f (2) [ ] the x-axis at x = [ ]. The largest zero is a zero of multiplicity [ ], so the graph of f (3) [ ] the x-axis at x = [ ].

(d) Determine the maximum number of turning points on the graph of the function.

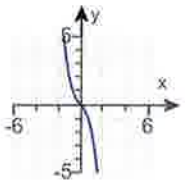
The graph of the function will have at most [ ] turning points.

(e) Use the information in parts **(a)** through **(d)** to draw a complete graph of the function. Choose the correct graph below.

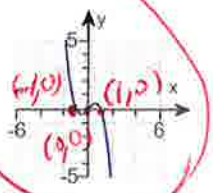
○ **A.**



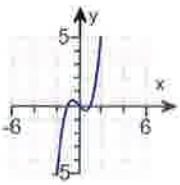
○ **B.**



● **C.**



○ **D.**



(1) ○ touches ○ crosses (2) ○ touches ○ crosses (3) ○ touches ○ crosses

Answers $-x^3$

$-1,0,1$

0

$-1,0,1$

1

(1) crosses

-1

1

(2) crosses

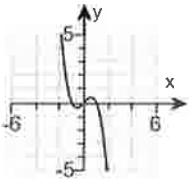
0

1

(3) crosses

1

2



C.

ID: 3.1.113

32. Analyze the polynomial function $f(x) = x^3 + 2x^2 - 35x$. Answer parts **(a)** through **(e)**. [Hint: First factor the polynomial.]

(a) Determine the end behavior of the graph of the function.

The graph of f behaves like y = ____ for large values of $|x|$.

(b) Find the x- and y-intercepts of the graph of the function.

The x-intercept(s) is/are ____.
(Type an integer or a simplified fraction. Use a comma to separate answers as needed. Type each answer only once.)

The y-intercept is ____.
(Type an integer or a simplified fraction.)

(c) Determine the zeros of the function and their multiplicity. Use this information to determine whether the graph crosses or touches the x-axis at each x-intercept.

The zero(s) of f is/are ____.
(Type an integer or a simplified fraction. Use a comma to separate answers as needed. Type each answer only once.)

The smallest zero is of multiplicity ____, so the graph of f (1) ____ the x-axis at x = ____.

The middle zero is of multiplicity ____, so the graph of f (2) ____ the x-axis at x = ____.

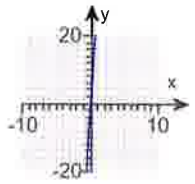
The largest zero is of multiplicity ____, so the graph of f (3) ____ the x-axis at x = ____.

(d) Determine the maximum number of turning points on the graph of the function.

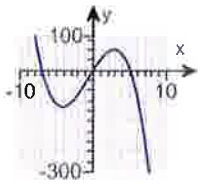
The graph of the function will have at most ____ turning points.

(e) Use the above information to draw a complete graph of the function by hand. Choose the correct graph below.

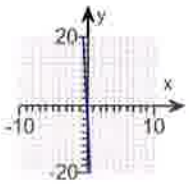
○ **A.**



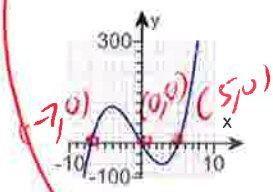
○ **B.**



○ **C.**



○ **D.**



(1) ○ crosses ○ touches (2) ○ touches ○ crosses (3) ○ crosses ○ touches

$f(x) = x^3 + 2x^2 - 35x = 0$

$x(x^2 + 2x - 35) = 0$

$x(x-5)(x+7) = 0$

$x = 0$ or $x - 5 = 0$ or $x + 7 = 0$

or $x - 5 + 5 = 0 + 5$ or $x + 7 - 7 = 0 - 7$

$x = 5$ or $x = -7$

$(-7, 0), (0, 0), (5, 0)$

Answers x^3

$-7,0,5$

0

$-7,0,5$

1

(1) crosses

-7

1

(2) crosses

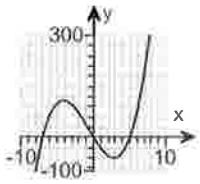
0

1

(3) crosses

5

2



D.

ID: 3.1.115

33. Use the rational zeros theorem to find all the real zeros of the polynomial function. Use the zeros to factor f over the real numbers.

$f(x) = x^3 + 3x^2 - 13x - 15$

Find the real zeros of f. Select the correct choice below and, if necessary, fill in the answer box to complete your answer.

A. x = _____

(Simplify your answer. Type an exact answer, using radicals as needed. Use integers or fractions for any rational numbers in the expression. Use a comma to separate answers as needed.)

B. There are no real zeros.

Use the real zeros to factor f.

f(x) = _____

(Simplify your answer. Type your answer in factored form. Type an exact answer, using radicals as needed. Use integers or fractions for any rational numbers in the expression.)

Answers A. x = **−5, −1, 3**

(Simplify your answer. Type an exact answer, using radicals as needed. Use integers or fractions for any rational numbers in the expression. Use a comma to separate answers as needed.)

$(x + 1)(x + 5)(x - 3)$

ID: 3.2.45

34. Solve the equation in the complex number system.

$x^2 - 12x + 40 = 0$

The solution set is { _____ }. (Use a comma to separate answers as needed.)

Answer: $6 - 2i, 6 + 2i$

ID: 3.3.2

35. Find the complex zeros of the following polynomial function. Write f in factored form.

$f(x) = x^3 - 6x^2 + 21x - 26$

The complex zeros of f are ____.

(Simplify your answer. Type an exact answer, using radicals and i as needed. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

Use the complex zeros to factor f.

$f(x) =$ ____

(Type your answer in factored form. Type an exact answer, using radicals and i as needed. Use integers or fractions for any numbers in the expression.)

Answers 2, 2 − 3 i, 2 + 3 i

$(x-2)(x-2+3i)(x-2-3i)$

ID: 3.3.33

36. Find the vertical, horizontal, and oblique asymptotes, if any, for the following rational function.

$R(x) = \frac{15x}{x+8}$

Select the correct choice below and fill in any answer boxes within your choice.

- A. The vertical asymptote(s) is/are x = ____. (Use a comma to separate answers as needed.)
- B. There is no vertical asymptote.

Select the correct choice below and fill in any answer boxes within your choice.

- A. The horizontal asymptote(s) is/are y = ____. (Use a comma to separate answers as needed.)
- B. There is no horizontal asymptote.

Select the correct choice below and fill in any answer boxes within your choice.

- A. The oblique asymptote(s) is/are y = ____. (Use a comma to separate answers as needed.)
- B. There is no oblique asymptote.

Answers A. The vertical asymptote(s) is/are x = −8. (Use a comma to separate answers as needed.)

A. The horizontal asymptote(s) is/are y = 15. (Use a comma to separate answers as needed.)

B. There is no oblique asymptote.

ID: 3.4.45

37. For $f(x) = 3x + 2$ and $g(x) = 9x$, find the following composite functions and state the domain of each.

(a) $f \circ g$ (b) $g \circ f$ (c) $f \circ f$ (d) $g \circ g$

(a) $(f \circ g)(x) =$ ☐ (Simplify your answer.)

Select the correct choice below and fill in any answer boxes within your choice.

- A. The domain of $f \circ g$ is $\{x \mid$ ☐ $\}$.
  (Type an inequality. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain of $f \circ g$ is all real numbers.

(b) $(g \circ f)(x) =$ ☐ (Simplify your answer.)

Select the correct choice below and fill in any answer boxes within your choice.

- A. The domain of $g \circ f$ is $\{x \mid$ ☐ $\}$.
  (Type an inequality. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain of $g \circ f$ is all real numbers.

(c) $(f \circ f)(x) =$ ☐ (Simplify your answer.)

Select the correct choice below and fill in any answer boxes within your choice.

- A. The domain of $f \circ f$ is $\{x \mid$ ☐ $\}$.
  (Type an inequality. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain of $f \circ f$ is all real numbers.

(d) $(g \circ g)(x) =$ ☐ (Simplify your answer.)

Select the correct choice below and fill in any answer boxes within your choice.

- A. The domain of $g \circ g$ is $\{x \mid$ ☐ $\}$.
  (Type an inequality. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain of $g \circ g$ is all real numbers.

Answers $27x + 2$

B. The domain of $f \circ g$ is all real numbers.

$27x + 18$

B. The domain of $g \circ f$ is all real numbers.

$9x + 8$

B. The domain of $f \circ f$ is all real numbers.

$81x$

B. The domain of $g \circ g$ is all real numbers.

ID: 4.1.23

(37) a $f(x) = 3x+2$ and $g(x) = 9x$ (inside here)

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

$f(g(x)) =$

$f(9x) =$

$3(9x)+2 =$

$27x+2$ ✓

domain $(-\infty, \infty)$

(37) b $f(x) = 3x+2$ and $g(x) = 9x$ (inside here)

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

$g(f(x)) =$

$g(3x+2) =$

$9(3x+2) =$

$27x+18$ ✓

domain $(-\infty, \infty)$

38.

(37) c $f(x) = 3x+2$ and $g(x) = 9x$ (inside itself)

$(f \circ f)(x) =$

$f(f(x)) =$

$f(3x+2) =$

$3(3x+2)+2 =$

$9x+6+2 =$

$9x+8$

domain $(-\infty, \infty)$

(37) (d) $f(x) = 3x+2$ and $g(x) = 9x$ (inside itself)

$(g \circ g)(x) =$

$g(g(x)) =$

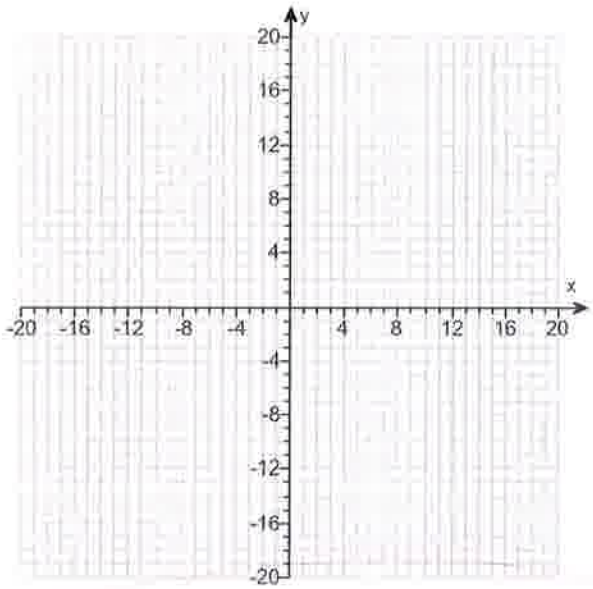
$g(9x) =$

$9(9x) =$

$81x =$

domain $(-\infty, \infty)$

The function $f(x) = 4x + 2$ is one-to-one.
(a) Find the inverse of f and check the answer.
(b) Find the domain and the range of f and f^{-1}.
(c) Graph f, f^{-1}, and $y = x$ on the same coordinate axes.



(a) $f^{-1}(x) =$ _____
(Simplify your answer. Use integers or fractions for any numbers in the expression.)

(b) Find the domain of f. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|x \geq$ _____ $\}$.
- B. The domain is $\{x|x \leq$ _____ $\}$.
- C. The domain is $\{x|x \neq$ _____ $\}$.
- D. The domain is the set of all real numbers.

Find the range of f. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The range is $\{y|y \neq$ _____ $\}$.
- B. The range is $\{y|y \geq$ _____ $\}$.
- C. The range is $\{y|y \leq$ _____ $\}$.
- D. The range is the set of all real numbers.

Find the domain of f^{-1}. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is $\{x|x \geq$ _____ $\}$.
- B. The domain is $\{x|x \neq$ _____ $\}$.
- C. The domain is $\{x|x \leq$ _____ $\}$.
- D. The domain is the set of all real numbers.

Find the range of f^{-1}. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The range is $\{y|y \leq$ _____ $\}$.
- B. The range is $\{y|y \geq$ _____ $\}$.
- C. The range is $\{y|y \neq$ _____ $\}$.
- D. The range is the set of all real numbers.

(c) Graph f, f^{-1}, and $y = x$ on the same coordinate axes. Use the graphing tool to graph the functions.

$f(x) = 4x + 2$
let $y = 4x + 2$ (let y =)
$x = 4y + 2$ (inv var x-y)
$x - 2 = 4y + 2 - 2$ (solve for y)
$x - 2 = 4y$
$\frac{x-2}{4} = \frac{4y}{4}$
$\frac{x-2}{4} = y$
$y = \frac{x-2}{4}$ (rewrite)
$f^{-1}(x) = \frac{x-2}{4}$ (inverse function)

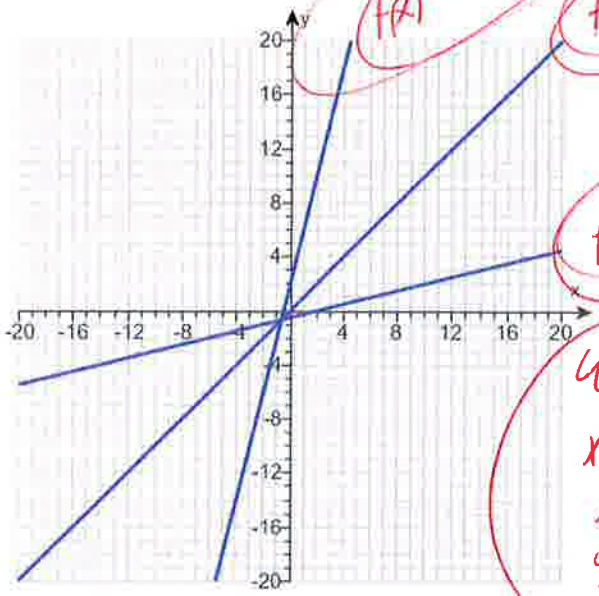
Answers $\frac{x-2}{4}$

D. The domain is the set of all real numbers.

D. The range is the set of all real numbers.

D. The domain is the set of all real numbers.

D. The range is the set of all real numbers.



$y_1 = 4x + 2$

$f(x) = 4x + 2$

$f(x) = x$

$y_2 = x$

$f(x) = \frac{x-2}{4}$

$y_3 = (x-2) \div 4$

Window
x-min = -12
x-max = 12
y-min = -10
y-max = 10

use graphing Calculator

ID: 4.2.53

39. Solve the equation.

$16^{-x+27} = 32^{x}$

$(2^4)^{-x+27} = (2^5)^{x}$ rewrite

$2^{-4x+108} = 2^{5x}$

The solution set is { }.
(Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

Answer: 12

$-4x + 108 = 5x$

$-4x + 108 - 108 = 5x - 108$

$-4x = 5x - 108$

Solve for x

$-4x - 5x = 5x - 108 - 5x$

$-9x = -108$

$\frac{-9x}{-9} = \frac{-108}{-9}$

$x = 12$

Prime
2, 3, 5, 7, 11, 13

216	32
108	16
54	8
27	4
9	2
3	1
1	

factor

ID: 4.3.73

40. If a single pane of glass obliterates 4% of the light passing through it, the percent p of light that passes through n successive panes is given approximately by the function below.

$p(n) = 100(0.96)^n$

(a) What percent of light will pass through 5 panes?
(b) What percent of light will pass through 15 panes?
(c) Explain the meaning of the base 0.96 in this problem.

(a) The percent of light that will pass through 5 panes is approximately _____%.
(Round to the nearest whole number as needed.)

(a) The percent of light that will pass through 15 panes is approximately _____%.
(Round to the nearest whole number as needed.)

(c) Choose the correct answer below.

- A. Each pane allows only 0.04% of light to pass through.
- B. Each pane allows only 4% of light to pass through.
- C. Each pane allows only 0.96% of light to pass through.
- D. Each pane allows only 96% of light to pass through.

Example
Radiation
obliterates
cancer after
n times of
application

Answers 82

54

D. Each pane allows only 96% of light to pass through.

ID: 4.3.105

Use graphing calculator

$P(1) = 100(0.96)^1$
$P(5) = 100(0.96)^5$
$P(5) = 81.53726976$ ✓
OR
$P(5) = 82$ ✓ Round

$P(15) = 100(0.96)^{15}$
$P(15) = 54.20863779$ ✓
OR
$P(15) = 54$ ✓ Round

41. The price p, in dollars, of a specific car that is x years old is modeled by the function below.

$p(x) = 22{,}275(0.89)^x$

(a) How much should a 5-year-old car cost?
(b) How much should a 7-year-old car cost?
(c) Explain the meaning of the base 0.89 in this problem.

(a) A 5-year-old car should cost approximately $ _____.
(Round to the nearest whole number as needed.)

(b) A 7-year-old car should cost approximately $ _____.
(Round to the nearest whole number as needed.)

(c) Choose the correct answer below.

- A. As each year passes, the car is worth 11% of its value the previous year.
- B. As each year passes, the car is worth 89% of its value the previous year.
- C. As each year passes, the car is worth 0.11% of its value the previous year.
- D. As each year passes, the car is worth 0.89% of its value the previous year.

NEW CARS and Trucks always go down in Value.

Answers 12,438

9,853

B. As each year passes, the car is worth 89% of its value the previous year.

ID: 4.3.107

Use Graphing Calculator

$P(x) = \$22275(0.89)^x$

$P(5) = \$22275(0.89)^{15}$

$P(5) = \$12438.492242$ ✓

OR

$P(5) = \$12{,}438$ ✓ Round

$P(7) = \$22275(0.89)^{17}$

$P(7) = \$9852.529848$ ✓

$P(7) = \$9{,}853$ ✓ Round

42. The percentage of patients P who have survived t years after initial diagnosis of a certain disease is modeled by the function $P(t) = 100(0.3)^t$.

(a) According to the model, what percent of patients survive 1 year after initial diagnosis?
(b) What percent of patients survive 2 years after initial diagnosis?
(c) Explain the meaning of the base 0.3 in the context of this problem.

(a) According to the model, _____ % of patients survive 1 year after initial diagnosis.
(Type an integer or a decimal.)

(b) According to the model, _____ % of patients survive 2 years after initial diagnosis.
(Type an integer or a decimal.)

(c) Explain the meaning of the base 0.3 in the context of this problem. Select the correct choice below and fill in the answer box to complete your choice.

- A. As each year passes, _____ % of the previous year's survivors have survived.
- B. As each year passes, _____ % of the previous survivors take the diagnosis.
- C. As each year passes, _____ % of the total patients have survived.

Answers 30
9

A. As each year passes, 30 % of the previous year's survivors have survived.

ID: 4.3.109

43. The function

$D(h) = 7e^{-0.57h}$

can be used to find the number of milligrams D of a certain drug that is in a patient's bloodstream h hours after the drug has been administered. How many milligrams will be present after 1 hour? After 9 hours?

After 1 hour, there will be _____ milligrams. (Round to two decimal places as needed.)

After 9 hours, there will be _____ milligrams. (Round to two decimal places as needed.)

Answers 3.96
0.04

ID: 4.3.111

44. Determine the domain of $f(x) = \log_3(x+6)$.

Choose the correct answer below.

- ○ $(6,\infty)$
- ○ $(0,\infty)$
- ○ $(-\infty,\infty)$
- ○ $(-6,\infty)$

Answer: $(-6,\infty)$

ID: 4.4.10

formula domain $f(x) = \log_3(Ax+B)$ set $Ax+B>0$

set $x+6>0$

$x+6-6>0-6$

$x>-6$

-6

$(-6,\infty)$

45. Change the exponential statement to an equivalent statement involving a logarithm.

$e^x = 20$

The equivalent logarithmic statement is _____. (Type an equation.)

Answer: $x = \ln 20$

ID: 4.4.17

formula $\ln A^N = N\ln(A)$

$e^x = 20$

$\ln(e^x) = \ln(20)$

$x\ln(e) = \ln(20)$

$x(1) = \ln(20)$

$x = \ln(20)$

$x = 2.995732274$

Round

$x = 2.996$ OR

46. Find the domain of the function.

$h(x) = \ln(x+8)$

The domain of h is _____.
(Type your answer in interval notation.)

Answer: $(-8,\infty)$

ID: 4.4.39

formula domain $f(x) = \ln(Ax+B)$ set $Ax+B>0$

set $x+8>0$

$x+8-8>0-8$

$x>-8$

-8

$(-8,\infty)$

47. Find the domain of the function.

$f(x) = 6 - 2\log_8\left[\frac{x}{2} - 6\right]$

The domain of f is _____.
(Type your answer in interval notation.)

Answer: $(12,\infty)$

ID: 4.4.43

formula domain $f(x) = \log_8(Ax+B)$ set $Ax+B>0$

$\frac{x}{2} - 6 > 0$

$\frac{x}{2} - 6 + 6 > 0 + 6$

$\frac{x}{2} > 6$

$2\left(\frac{x}{2}\right) > 2(6)$ mult

$x > 12$

12

$(12,\infty)$

48. Solve the equation.

$\log_2(8x+5) = 5$

Change the given logarithmic equation to exponential form.

(Type an equation. Do not simplify.)

The solution set is { }.
(Simplify your answer. Use a comma to separate answers as needed.)

Answers $8x+5=2^5$

$\frac{27}{8}$

ID: 4.4.91-Setup & Solve

$\log_2(8x+5) = 5$ (rewrite)

$2^5 = 8x+5$

$2\cdot2\cdot2\cdot2\cdot2 = 8x+5$

$32 = 8x+5$

$32-5 = 8x+5-5$

$27 = 8x$

$\frac{27}{8} = \frac{8x}{8}$

$\frac{27}{8} = x$

49. Solve the following equation. Write the answer in terms of the natural logarithm.

$e^{7x} = 5$

The solution set is { }.
(Type an exact answer in simplified form. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

Answer: $\frac{\ln 5}{7}$

ID: 4.4.101

$e^{7x} = 5$

$\ln(e^{7x}) = \ln(5)$

$7x \ln e = \ln(5)$

$7x(1) = \ln(5)$

$7x = \ln(5)$

$\frac{7x}{7} = \frac{\ln(5)}{7}$

$x = \frac{\ln(5)}{7}$

OR

$x = .2299197018$

$x = .2299$ Round

50. Solve the equation. Write the answer in terms of the natural logarithm.

$e^{3x+4} = 6$

The solution set is { }.
(Type an exact answer in simplified form. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

Answer: $\frac{\ln 6 - 4}{3}$

ID: 4.4.103

$e^{3x+4} = 6$

$\ln(e^{3x+4}) = \ln(6)$

$(3x+4)\ln(e) = \ln(6)$

$(3x+4)(1) = \ln(6)$

$3x+4 = \ln(6)$

$3x+4-4 = \ln(6)-4$

$3x = \ln(6)-4$

$\frac{3x}{3} = \frac{\ln(6)-4}{3}$

$x = \frac{(\ln(6)-4)}{3}$

OR

$x = -.7360801769$

OR

$x = -.7361$ Round

51. Solve the equation. Write the answer in terms of the natural logarithm.

$5e^{0.5x} = 14$

The solution set is { }.
(Type an exact answer. Simplify your answer. Use a comma to separate answers as needed.)

Answer: $\frac{\ln 2.8}{0.5}$

ID: 4.4.109

formula $\ln(A^N) = N\ln A$, $\ln(e) = 1$

$\frac{5e^{0.5x}}{5} = \frac{14}{5}$

$e^{0.5x} = \frac{14}{5}$

$\ln(e^{0.5x}) = \ln\left(\frac{14}{5}\right)$

$0.5x\ln(e) = \ln\left(\frac{14}{5}\right)$

$0.5x(1) = \ln\left(\frac{14}{5}\right)$

$\frac{0.5x}{0.5} = \frac{\ln\left(\frac{14}{5}\right)}{0.5}$

$x = \frac{\ln(2.8)}{0.5}$

$x = 2.059238834$

OR

$x = 2.059$ Round

52. Solve the equation. Write the answer in terms of the common logarithm.

$4 \cdot 10^{2-x} = 15$

The solution set is { }.
(Type an exact answer in simplified form. Use a comma to separate answers as needed.)

Answer: $2 - \log\frac{15}{4}$

ID: 4.4.111

formula $\ln(A^N) = N\ln A$

OR

$\frac{4 \cdot 10^{2-x}}{4} = \frac{15}{4}$

$10^{2-x} = \frac{15}{4}$

$\log_{10}(10)^{2-x} = \log_{10}\left(\frac{15}{4}\right)$

$(2-x)\log_{10}(10) = \log_{10}\left(\frac{15}{4}\right)$

$(2-x)(1) = \log_{10}\left(\frac{15}{4}\right)$

$2 - x = \log_{10}\left(\frac{15}{4}\right)$

$2 - x - 2 = \log_{10}\left(\frac{15}{4}\right) - 2$

$-x = \log_{10}\left(\frac{15}{4}\right) - 2$

$-1(-x) = -1\left(\log_{10}\left(\frac{15}{4}\right) - 2\right)$

$x = -1\log_{10}\left(\frac{15}{4}\right) + 2$

$x = 2 - 1\log_{10}\left(\frac{15}{4}\right)$

$x = 1.425968732$

OR

$x = 1.426$ Round

$\frac{4 \cdot 10^{2-x}}{4} = \frac{15}{4}$

$10^{2-x} = \frac{15}{4}$

$\ln(10)^{2-x} = \ln\left(\frac{15}{4}\right)$

$(2-x)\ln(10) = \ln\left(\frac{15}{4}\right)$

$\frac{(2-x)\ln(10)}{\ln(10)} = \frac{\ln\left(\frac{15}{4}\right)}{\ln(10)}$

$2 - x = \frac{\ln\left(\frac{15}{4}\right)}{\ln(10)}$

$2 - x - 2 = \frac{\ln\left(\frac{15}{4}\right)}{\ln(10)} - 2$

$-x = \frac{\ln\left(\frac{15}{4}\right)}{\ln(10)} - 2$

$-1(-x) = -1\left(\frac{\ln\left(\frac{15}{4}\right)}{\ln(10)} - 2\right)$

$x = -1\frac{\ln\left(\frac{15}{4}\right)}{\ln(10)} + 2$

$x = 2 - 1\frac{\ln\left(\frac{15}{4}\right)}{\ln(10)}$

$x = 1.425968732$

OR

$x = 1.426$ Round

53. Suppose that $G(x) = \log_4(2x + 2) - 3$.

(a) What is the domain of G?
(b) What is G(7)? What point is on the graph of G?
(c) If G(x) = 2, what is x? What point is on the graph of G?
(d) What is the zero of G?

(a) The domain of G is _____. (Type your answer in interval notation.)

(b) G(7) = _____

The point _____ is on the graph of G. (Type an ordered pair.)

(c) If G(x) = 2, then x = _____.

The point _____ is on the graph of G. (Type an ordered pair.)

(d) The zero of G is x = _____.

Answers (− 1,∞)
− 1
(7, − 1)
511
(511,2)
31

ID: 4.4.113

54. The atmospheric pressure p on a balloon or an aircraft decreases with increasing height. This pressure, measured in millimeters of mercury, is related to the height h (in kilometers) above sea level by the formula $p = 760\, e^{-0.145h}$.

(a) Find the height of an aircraft if the atmospheric pressure is 329 millimeters of mercury.

The height of the aircraft is _____ kilometers. (Round to two decimal places.)

(b) Find the height of a mountain if the atmospheric pressure is 526 millimeters of mercury.

The height of the mountain is _____ kilometers. (Round to two decimal places.)

Answers 5.77
2.54

ID: 4.4.121

Example: Probability of SHARK attack at Coast after € YEARS.

55. Between 12:00 PM and 1:00 PM, cars arrive at a bank's drive-thru at the rate of 6 cars per hour (0.1 car per minute). The following formula from statistics can be used to determine the probability that a car will arrive within t minutes of 12:00 PM.

$F(t) = 1 - e^{-0.1t}$

$1 - e^{-0.1t} = .40$

$1 - e^{-0.1t} - 1 = .40 - 1$

$-e^{-0.1t} = -.60$

$-1(-e^{-0.1t}) = -1(-.60)$

$e^{-0.1t} = .60$

$\ln(e^{-0.1t}) = \ln(.60)$

$-0.1t \ln(e) = \ln(.60)$

$-0.1t(1) = \ln(.60)$

$\frac{-0.1t}{-0.1} = \frac{\ln(.60)}{-0.1}$

$t = 5.108256238$ OR

$t = 5.11$ Round

(a) Determine how many minutes are needed for the probability to reach 40%.
About [ ] minutes are needed for the probability to reach 40%.
(Round to two decimal places as needed.)

(b) Determine how many minutes are needed for the probability to reach 90%.
About [ ] minutes are needed for the probability to reach 90%.
(Round to two decimal places as needed.)

$1 - e^{-0.1t} = .90$

$1 - e^{-0.1t} - 1 = .90 - 1$

$-e^{-0.1t} = -.10$

$-1(-e^{-0.1t}) = -1(-.10)$

$e^{-0.1t} = .10$

$\ln(e^{-0.1t}) = \ln(.10)$

$-0.1t \ln(e) = \ln(.10)$

$-0.1t(1) = \ln(.10)$

$\frac{-0.1t}{-0.1} = \frac{\ln(.10)}{-0.1}$

$t = 23.02585093$

$t = 23.03$ OR Round

(c) Is it possible for the probability to equal 100%? Explain. Select the correct choice below and, if necessary, fill in the answer box within your choice.

- **A.** Yes, about [ ] minutes are needed for the probability to reach 100%. (Round to two decimal places as needed.)
- **B.** No, because when determining the number of minutes, the exponential equation cannot be changed to a logarithmic equation, as the domain of the logarithmic function is $x > 0$.

Answers 5.11

23.03

B.

No, because when determining the number of minutes, the exponential equation cannot be changed to a logarithmic equation, as the domain of the logarithmic function is $x > 0$.

ID: 4.4.123

Example: PAIN killer in patients bloodstream.

56. The formula

$D = 5e^{-0.1h}$

can be used to find the number of milligrams D of a certain drug that is in a patient's bloodstream h hours after the drug was administered. When the number of milligrams reaches 2, the drug is to be administered again. What is the time between injections?

The time between injections is [ ] hour(s).
(Type an integer or a decimal rounded to two decimal places as needed.)

Answer: 9.16

$2 = 5e^{-0.1h}$

$\frac{2}{5} = \frac{5e^{-0.1h}}{5}$

$\frac{2}{5} = e^{-0.1h}$

$\ln(\frac{2}{5}) = \ln(e^{-0.1h})$

$\ln(\frac{2}{5}) = -0.1h \ln(e)$

$\ln(\frac{2}{5}) = -0.1h(1)$

$\ln(\frac{2}{5}) = -0.1h$

$\frac{\ln(\frac{2}{5})}{-0.1} = \frac{-0.1h}{-0.1}$

$9.162907319 = h$

OR

$9.16 = h$ Round

ID: 4.4.125

57. The concentration of alcohol in a person's blood is measurable. Suppose that the relative risk R (given as a percent) of having an accident while driving a car can be modeled by the equation $R = 3e^{kx}$ where x is the variable concentration of alcohol in the blood and k is a constant.

(a) Suppose that a concentration of alcohol in the blood of 0.06 results in a 10% relative risk (R = 10) of an accident. Find the constant k in the equation.

k = _____ (Round to two decimal places as needed.)

(b) Using the value of k found in part (a), what is the relative risk if the concentration is 0.14?

R = _____ % (Round to the nearest percent as needed.)

(c) Using the same value of k found in part (a), what concentration of alcohol corresponds to a relative risk of 100%?

x = _____ (Round to three decimal places as needed.)

(d) Using the value of k found in part (a), if the law asserts that anyone with a relative risk of having an accident of 15% or more should not have driving privileges, at what concentration of alcohol in the blood should a driver be arrested and charged with a DUI?

x = _____ (Round to two decimal places as needed.)

Answers 20.07
50
0.175
0.08

ID: 4.4.135

58. Write the expression as a sum and/or difference of logarithms. Express powers as factors.

$\ln\left(x^{14}\sqrt{5-x}\right), 0 < x < 5$

$\ln\left(x^{14}\sqrt{5-x}\right)$ = _____ (Simplify your answer.)

Answer: $14\ln x + \frac{1}{2}\ln(5-x)$

ID: 4.5.47

59. Write the expression as a sum and/or difference of logarithms. Express powers as factors.

$\log\left[\frac{x(x+7)}{(x+6)^7}\right], x>0$

$\log\left[\frac{x(x+7)}{(x+6)^7}\right] =$ ____ (Simplify your answer.)

Answer: $\log x + \log(x+7) - 7\log(x+6)$

ID: 4.5.51

60. Write the expression as a single logarithm.

$2\log_7(x+5) - \log_7(x-8) - \log_7(x-12)$

$2\log_7(x+5) - \log_7(x-8) - \log_7(x-12) =$ ____ (Simplify your answer.)

Answer: $\log_7\left[\frac{(x+5)^2}{(x-8)(x-12)}\right]$

ID: 4.5.69

61. Solve the logarithmic equation.

$\log_8(x+6) = \log_8 7$

Determine the equation to be solved after removing the logarithm.

____

(Type an equation. Do not simplify.)

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The solution set is {____}.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

B. There is no solution.

Answers $x+6=7$

A. The solution set is {1}.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

ID: 4.6.9-Setup & Solve

62. Solve the logarithmic equation.

$\log x + \log (x - 99) = 2$

Determine the equation to be solved after removing the logarithm.

(Type an equation. Do not simplify.)

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The solution set is { }.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

B. There is no solution.

Answers $x(x - 99) = 10^2$

A. The solution set is { 100 }.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

ID: 4.6.17-Setup & Solve

63. Solve the following logarithmic equation.

$\log (7x + 3) = 1 + \log (x - 8)$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The solution set is { }.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

B. There is no solution.

Answer: A. The solution set is { $\frac{83}{3}$ }.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

ID: 4.6.19

64. Solve the following logarithmic equation.

$\log_2(x+11) + \log_2(x+9) = 3$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The solution set is { } (Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

B. There is no solution.

Answer: A. The solution set is {−7}.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

ID: 4.6.21

65. Solve the following logarithmic equation. Express irrational solutions in the exact form and as decimals.

$2\log_7(x-4) - \log_7 100 = \log_7 4$

The solution set is { }.
(Use a comma to separate answers as needed. Simplify your answers. Type exact answers, using radicals as needed.)

Express irrational solutions as decimals. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The irrational values of the solutions set rounded to three decimal places are { }.
(Use a comma to separate answers as needed. Round to three decimal places as needed.)

B. The solution set has no irrational solutions.

Answers 24

B. The solution set has no irrational solutions.

ID: 4.6.33

66. Solve the following exponential equation. Express irrational solutions in exact form and as a decimal rounded to three decimal places.

$8^{x-3} = 64$

What is the exact answer? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The solution set is { }.
  (Simplify your answer. Type an exact answer.)
- B. There is no solution.

What is the answer rounded to three decimal places? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The solution set is { }.
  (Simplify your answer. Type an integer or decimal rounded to three decimal places as needed.)
- B. There is no solution.

Answers A. The solution set is {5}. (Simplify your answer. Type an exact answer.)

A. The solution set is {5.000}.
(Simplify your answer. Type an integer or decimal rounded to three decimal places as needed.)

ID: 4.6.41

$8^{x-3} = 64$

$8^{x-3} = 8^2$ (rewrite)

$x-3 = 2$

$x-3+3 = 2+3$

$x = 5$ answer

OR

$\ln(8^{x-3}) = \ln(64)$

$(x-3)\ln(8) = \ln(64)$

$\frac{(x-3)\ln(8)}{\ln(8)} = \frac{\ln(64)}{\ln(8)}$

$x-3 = \frac{\ln(64)}{\ln(8)}$

$x-3+3 = \frac{\ln(64)}{\ln(8)} + 3$

$x = \frac{\ln(64)}{\ln(8)} + 3$

$x = 5$ answer

1st Method

Other Method

Formula $\ln(A^N) = N\ln(A)$

67. Solve the following exponential equation. Express irrational solutions in exact form and as a decimal rounded to three decimal places.

$6^x = 8$

What is the exact answer? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The solution set is { }. (Simplify your answer. Type an exact answer.)
- B. There is no solution.

What is the answer rounded to three decimal places? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The solution set is { }. (Simplify your answer. Type an integer or decimal rounded to three decimal places as needed.)
- B. There is no solution.

Answers A. The solution set is $\left\{\frac{\ln 8}{\ln 6}\right\}$. (Simplify your answer. Type an exact answer.)

A. The solution set is {1.161}. (Simplify your answer. Type an integer or decimal rounded to three decimal places as needed.)

ID: 4.6.43

68. The population of a certain country in 1999 was 286 million people. In addition, the population of the country was growing at a rate of 1.0% per year. Assuming that this growth rate continues, the model $P(t) = 286(1.010)^{t-1999}$ represents the population P (in millions of people) in year t.
According to this model, when will the population of the country reach
(a) 315 million people?
(b) 380 million people?

(a) The population of the country will reach 315 million people during the year _____.
(Round down to the nearest whole number as needed.)

(b) The population of the country will reach 380 million people during the year _____.
(Round down to the nearest whole number as needed.)

Answers 2008

2027

ID: 4.6.107

$$\frac{\ln(1.101399)}{\ln(1.010)} = \frac{(t-1999)\ln(1.101)}{\ln(1.101)}$$

$$\frac{\ln(1.101399)}{\ln(1.010)} = t-1999$$

$$\frac{\ln(1.101399)}{\ln(1.010)} + 1999 = t-1999+1999$$

$$2008.70633 = t$$

$$2008 = t$$

$t-1999$

$$380 = 286(1.010)^{t-1999}$$

$$\frac{380}{286} = \frac{286(1.010)^{t-1999}}{286}$$

$$1.328671 = (1.010)^{t-1999}$$

$$\ln(1.328671) = \ln(1.010)^{t-1999}$$

$$\ln(1.328671) = (t-1999)\ln(1.010)$$

$$\frac{\ln(1.328671)}{\ln(1.010)} = \frac{(t-1999)\ln(1.010)}{\ln(1.010)}$$

$$\frac{\ln(1.328671)}{\ln(1.010)} = t-1999$$

$$\frac{\ln(1.328671)}{\ln(1.010)} + 1999 = t-1999+1999$$

$$2027.559773 = t$$

$$2027 = t$$

OR

69. Find the amount that results from the given investment.

$600 invested at 5% compounded quarterly after a period of 3 years

After 3 years, the investment results in $ _____.
(Round to the nearest cent as needed.)

Answer: 696.45

ID: 4.7.7

70. How long does it take for an investment to double in value if it is invested at 20% compounded quarterly? Compounded continuously?

At 20% compounded quarterly, the investment doubles in about _____ years.
(Round to two decimal places as needed.)

At 20% compounded continuously, the investment doubles in about _____ years.
(Round to two decimal places as needed.)

Answers 3.55
3.47

ID: 4.7.35

71. How many years will it take for an initial investment of $30,000 to grow to $75,000? Assume a rate of interest of 5% compounded continuously.

It will take about _____ years for the investment to grow to $75,000.
(Round to two decimal places as needed.)

Answer: 18.33

ID: 4.7.41

72. The population of a colony of mosquitoes obeys the law of uninhibited growth. Use this information to answer parts (a) through (c).

(a) If N is the population of the colony and t is the time in days, express N as a function of t. Consider N_0 is the original amount at t = 0 and $k \neq 0$ is a constant that represents the growth rate.

N(t) = _____ (Type an expression using t as the variable and in terms of e.)

(b) The population of a colony of mosquitoes obeys the law of uninhibited growth. If there are 1000 mosquitoes initially and there are 1500 after 1 day, what is the size of the colony after 3 days?

Approximately _____ mosquitoes.
(Do not round until the final answer. Then round to the nearest whole number as needed.)

(c) How long is it until there are 70,000 mosquitoes?

About _____ days.
(Do not round until the final answer. Then round to the nearest tenth as needed.)

Answers $N_0 e^{kt}$
3375
10.5

ID: 4.8.5

73. The half-life of carbon-14 is 5600 years. If a piece of charcoal made from the wood of a tree shows only 68% of the carbon-14 expected in living matter, when did the tree die?

The tree died about _____ years ago.
(Do not round until the final answer. Then round to the nearest whole number.)

Answer: 3116

ID: 4.8.11

74. After the release of radioactive material into the atmosphere from a nuclear power plant in a country in 1995, the hay in that country was contaminated by a radioactive isotope (half-life 8 days). If it is safe to feed the hay to cows when 12% of the radioactive isotope remains, how long did the farmers need to wait to use this hay?

The farmers needed to wait approximately _____ days for it to be safe to feed the hay to the cows.
(Round to one decimal place as needed.)

Answer: 24.5

ID: 4.8.21

75. Uninhibited growth can be modeled by exponential functions other than $A(t) = A_0 e^{kt}$. For example, if an initial population P_0 requires n units of time to triple, then the function $P(t) = P_0(3)^{\frac{t}{n}}$ models the size of the population at time t. An insect population grows exponentially. Complete the parts a through d below.

(a) If the population triples in 30 days, and 50 insects are present initially, write an exponential function of the form $P(t) = P_0(3)^{\frac{t}{n}}$ that models the population.

$P(t) =$ [ ]

(b) What will the population be in 46 days?

The population in 46 days will be [ ].
(Round to the nearest integer as needed.)

(c) When will the population reach 700?

The population will reach 700 in [ ] days.
(Round to one decimal place as needed.)

(d) Express the model from part (a) in the form $A(t) = A_0 e^{kt}$.

$P(t) =$ [ ]
(Use integers or decimals for any numbers in the expression. Round to three decimal places as needed.)

Answers

$50(3)^{\frac{t}{30}}$

269

72.1

$50\,e^{0.037t}$

ID: 4.8.32-GC

76. Solve the system of equations. If the system has no solution, say that it is inconsistent.

$$\begin{cases} 4x - 3y = -1 \\ 10x + y = 23 \end{cases}$$

Select the correct choice below and, if necessary, fill in any answer boxes within your choice.

- A. The solution of the system is x = _____ and y = _____. (Type an integers or simplified fractions.)
- B. There are infinitely many solutions. Using ordered pairs, the solution can be written as $\{(x,y) \mid x =$ _____, y any real number$\}$. (Simplify your answer. Type an expression using y as the variable as needed.)
- C. The system is inconsistent.

Answer: A. The solution of the system is x = 2 and y = 3. (Type an integers or simplified fractions.)

ID: 6.1.33

77. Solve the given system of equations. If the system has no solution, say that it is inconsistent.

$$\begin{cases} x - 2y + 3z = 4 \\ 2x + y + z = -2 \\ -3x + 2y - 2z = -1 \end{cases}$$

Select the correct choice below and fill in any answer boxes within your choice.

- A. The solution is x = _____, y = _____, and z = _____. (Type integers or simplified fractions.)
- B. There are infinitely many solutions. Using ordered triplets, they can be expressed as $\{(x,y,z) \mid x =$ _____, y = _____, z any real number$\}$. (Simplify your answers. Type expressions using z as the variable as needed.)
- C. There are infinitely many solutions. Using ordered triplets, they can be expressed as $\{(x,y,z) \mid x =$ _____, y any real number, z any real number$\}$. (Simplify your answer. Type an expression using y and z as the variables as needed.)
- D. The system is inconsistent.

Answer: A.

The solution is x = −1, y = −1, and z = 1. (Type integers or simplified fractions.)

ID: 6.1.45

78. Find the sum of the sequence.

$$\sum_{k=1}^{5} (4k-4)$$

$$\sum_{k=1}^{5} (4k-4) = \square$$

Answer: 40

ID: 7.1.73

$(4(1)-4)+(4(2)-4)+(4(3)-4)+(4(4)-4)+(4(5)-4)=$

$(4-4)+(8-4)+(12-4)+(16-4)+(20-4)=$

$(0)+(4)+(8)+(12)+(16)=$

40

OR use graphing calculator, Math, 1, summation

79. Expand the expression using the binomial theorem.

$$(x+2)^6$$

$(x+2)^6 = \square$

Answer: $x^6 + 12x^5 + 60x^4 + 160x^3 + 240x^2 + 192x + 64$

ID: 7.5.17

$${}_6C_0(x)(2)^0 + {}_6C_1(x)(2)^1 + {}_6C_2(x)^4(2)^2 + {}_6C_3(x)^3(2)^3 + {}_6C_4(x)^2(2)^4 + {}_6C_5(x)^1(2)^5 + {}_6C_6(x)^0(2)^6 =$$

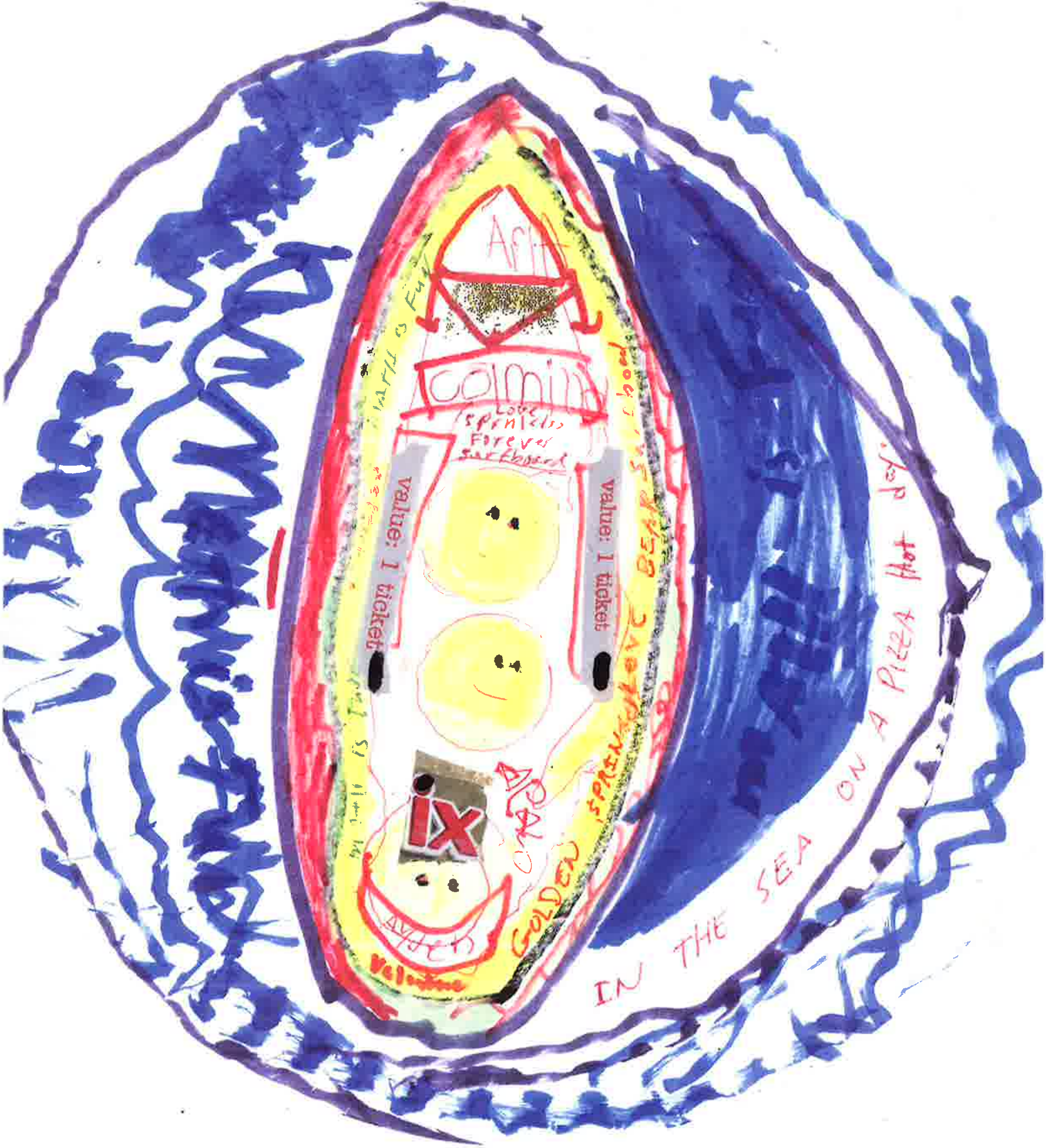
$$(1)(x^6)(1) + (6)(x^5)(2) + (15)(x^4)(4) + (20)(x^3)(8) + (15)(x^2)(16)$$

$$+ (6)(x^1)(32) + (1)(1)(64) =$$

$$x^6 + 12x^5 + 60x^4 + 160x^3 + 240x^2 + 192x + 64 =$$

6, Math, PRB, 0, enter = 1
6, Math, PRB, 1, enter = 6
6, Math, PRB, 2, enter = 15
6, Math, PRB, 3, enter = 20
6, Math, PRB, 4, enter = 15
6, Math, PRB, 5, enter = 6
6, Math, PRB, 6, enter = 1

use graphing calculator


Love sprinkles Forever surfboard
value: I ticket
value: I ticket
ix
GOLDEN
Valentine
IN THE SEA ON A PIZZA Hot dog

SMART Bird 5-8-17

$\frac{1}{3} \times \frac{4}{4} = \frac{4}{12}$, $\frac{2}{4} \times \frac{3}{3} = \frac{6}{12}$

MATH IS FUN

$\frac{4}{12} + \frac{6}{12} = \frac{10}{12} = \frac{5}{6}$

$\frac{12}{12} - \frac{10}{12} = \frac{2}{12}$ or $\frac{1}{6}$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MATH is
FUN


MATH
MATH
MATH is Fun

(exponential growth)

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