12-01-19 12-03-19 12-05-19 12-07-19

Student: _____ **Instructor:** Alfredo Alvarez **Assignment:**
Date: _____ **Course:** Math 1314 Sullivan Coreq finalm1314COC036sullIljjRZZ09B

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

(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 -3

87

57

$3x^2 - 3x - 3$

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

$3x^2 + 15x + 15$

$48x^2 + 12x - 3$

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

ID: 1.1.43

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

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

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

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

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

$f(0) = 0 - 3$

$f(0) = -3$ ✓

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

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

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

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

$f(5) = 75 + 15 - 3$

$f(5) = 90 - 3$

$f(5) = 87$ ✓

(1) c

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

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

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

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

$f(-5) = 75 - 15 - 3$

$f(-5) = 60 - 3$

$f(-5) = 57$

(1) d

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

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

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

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

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

① e $f(x) = 3x^2 + 3x - 3$

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

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

① f $f(x) = 3x^2 + 3x - 3$

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

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

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

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

$f(x+2) = 3x^2 + 12x + 12 + 3x + 6 - 3$

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

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

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

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

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

$f(4x) = 48x^2 + 12x - 3$ ✓

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

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

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

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

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

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

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

✓2. Find the domain of the function.

$f(x) = \sqrt{4x - 12}$

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

Answer: $[3,\infty)$

ID: 1.1.59

$f(x) = \sqrt{4x-12}$

$4x - 12 \geq 0$

$4x - 12 + 12 \geq 0 + 12$

$4x \geq 12$

$\frac{4x}{4} \geq \frac{12}{4}$

$x \geq 3$

$[3, \infty)$

formula domain

$f(x) = \sqrt{Ax+B}$

$Ax + B \geq 0$

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

$f(x) = 5x + 8$; $g(x) = 8x - 3$

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

$(f+g)(x) = f(x) + g(x) = (5x+8) + (8x-3) = 5x + 8 + 8x - 3 = 13x + 5$

domain $(-\infty, \infty)$

$(f-g)(x) = f(x) - g(x) = (5x+8) - (8x-3) = 5x + 8 - 8x + 3 = -3x + 11$

domain $(-\infty, \infty)$

$(f \cdot g)(x) = f(x) \cdot g(x) = (5x+8)(8x-3) = 40x^2 - 15x + 64x - 24 = 40x^2 + 49x - 24$

domain $(-\infty, \infty)$

$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{5x+8}{8x-3}$

Set $8x - 3 = 0$

$8x - 3 + 3 = 0 + 3$

$8x = 3$

$\frac{8x}{8} = \frac{3}{8}$

$x \neq \frac{3}{8}$

domain

$(f+g)(x) = 13x + 5$

$(f+g)(2) = 13(2) + 5$

$(f+g)(2) = 26 + 5$

$(f+g)(2) = 31$

$(f+g)(2) =$ _____ (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 $13x + 5$

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

$-3x + 11$

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

$40x^2 + 49x - 24$

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

$\frac{5x+8}{8x-3}$

A. The domain is $\left\{x \middle| x \neq \frac{3}{8}\right\}$.

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

31

-1

483

$\frac{13}{5}$

ID: 1.1.67

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

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

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

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

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

Domain $(-\infty, \infty)$

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.)

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

Domain $(-\infty, \infty)$

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.)

$(f \cdot g)(x) =$
$f(x) \cdot g(x) =$
$(x-7)(7x^2) =$
$7x^3 - 49x^2 =$

Domain $(-\infty, \infty)$

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}.

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

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

$\left(\frac{f}{g}\right)(x) =$
$\frac{f(x)}{g(x)} =$
$\frac{x-7}{7x^2} =$

Set $7x^2 = 0$
$\frac{7x^2}{7} = \frac{0}{7}$
$x^2 = 0$
$\sqrt{x^2} = \sqrt{0}$
$x = 0$

Domain $x \neq 0$

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 $(f + g)(3)$.

$(f+g)(x) = 7x^2 + x - 7$
$(f+g)(3) = 7(3)^2 + (3) - 7$
$(f+g)(3) = 7(3)(3) + (3) - 7$
$(f+g)(3) = 7(9) + (3) - 7$
$(f+g)(3) = 63 + 3 - 7$
$(f+g)(3) = 59$

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

(f) Find $(f-g)(2)$.

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

(g) Find $(f \cdot g)(4)$.

$(f \cdot g)(4) =$ _____ (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 $7x^2 + x - 7$

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

$-7x^2 + x - 7$

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

$7x^3 - 49x^2$

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

$\frac{x-7}{7x^2}$

A. The domain is {x| x ≠ 0}.

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

59

-33

-336

$-\frac{4}{63}$

ID: 1.1.69

5. 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.

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

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

Answer: $2x + h - 2$

ID: 1.1.83

✓ 6. Given $f(x) = x^2 - 2x + 4$, find the value(s) for x such that $f(x) = 12$.

The solution set is { }.

Answer: −2,4

ID: 1.1.91

Possibly 8.1 (2.4)

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

$x^2 - 2x + 4 - 12 = 0$

$x^2 - 2x - 8 = 0$ factor

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

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

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

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

OR

Use Quadratic formula

$1x^2 - 2x - 8 = 0$

$a=1,\ b=-2,\ c=-8$

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

$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-8)}}{2(1)}$

$x = \frac{2 \pm \sqrt{4+32}}{2}$

$x = \frac{2 \pm \sqrt{36}}{2}$

$x = \frac{2 \pm 6}{2}$

$x = \frac{2}{2} \pm \frac{6}{2}$

$x = 1 \pm 3$

$x = 1-3$ OR $x = 1+3$

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

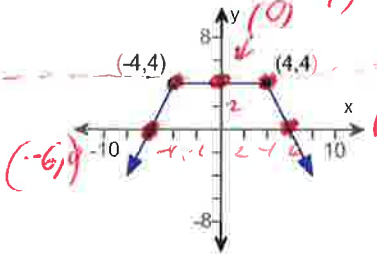
7.

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 $(-\infty, 4]$.
  (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.** $(-6, 0)$ $(6, 0)$ $(0, 4)$
  (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 x-axis.
- (•) **B.** It is symmetrical with respect to the y-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 $(-\infty,4]$. (Type your answers in interval notation.)

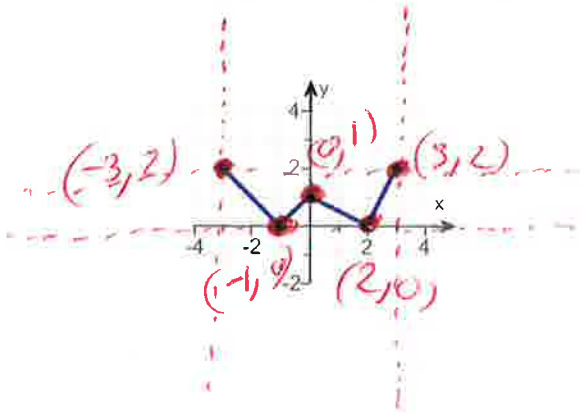
A. $(6,0),(-6,0),(0,4)$ (Type an ordered pair. Use a comma to separate answers as needed.)

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

ID: 1.2.21

8. 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?

(-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]

(Type your answer in interval notation.)

The range is [0, 2]

(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.
- even.
- odd.

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

$[-3,3]$

$[0,2]$

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

---

9. The function f is defined as follows.

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

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

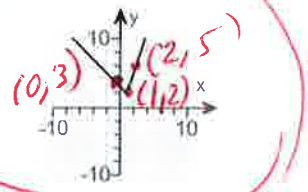
(a) The domain of the function f is $(-\infty, \infty)$. ← (left, right)
(Type your answer in interval notation.)

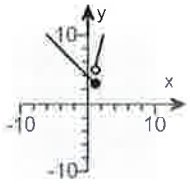
(b) Locate any intercepts. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

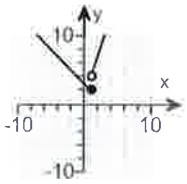
A. The intercept(s) is/are $(0,3)$ y-intercept
(Type an ordered pair. Use a comma to separate answers as needed.)

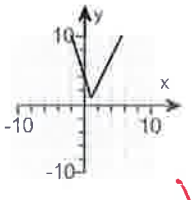
B. There are no intercepts.

(c) Choose the correct graph below.

A. 

B. 

C. 

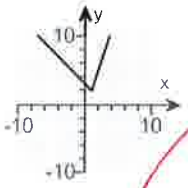
D. 

Use graphing calculator

(d) The range of the function f is $[2, \infty)$ ← [bottom, top)
(Type your answer in interval notation.)

Answers $(-\infty, \infty)$

A. The intercept(s) is/are (0,3).
(Type an ordered pair. Use a comma to separate answers as needed.)



A.

$[2, \infty)$

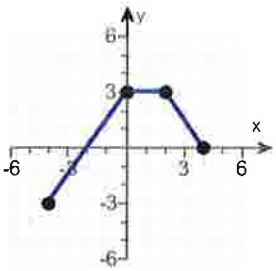
ID: 1.4.33

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

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

Y1 = -x+3 ÷ (x<1) 2nd Math
Y2 = 3x-1 ÷ (x≥1)
Open Circle
Close Circle

10. 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.

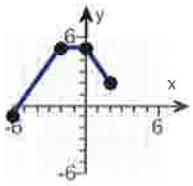


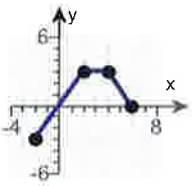
(a) $F(x) = f(x) + 2$ (b) $G(x) = f(x + 3)$ (c) $P(x) = -f(x)$

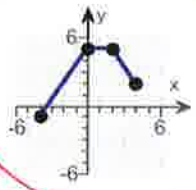
(d) $H(x) = f(x + 1) - 3$ (e) $Q(x) = \frac{1}{3}f(x)$ (f) $g(x) = f(-x)$

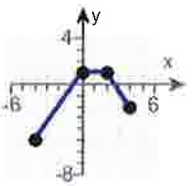
(g) $h(x) = f(2x)$

(a) Choose the correct graph of $F(x) = f(x) + 2$ below.

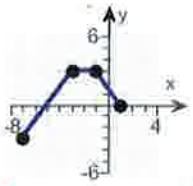
A. 

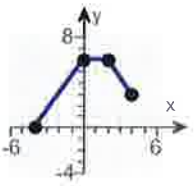
B. 

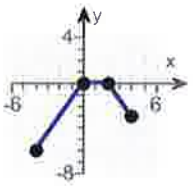
C. 

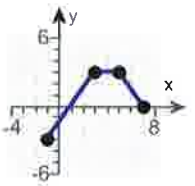
D. 

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

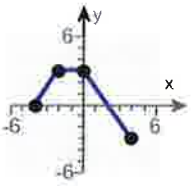
A. 

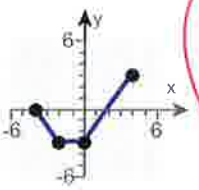
B. 

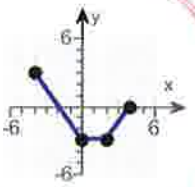
C. 

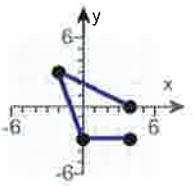
D. 

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

A. 

B. 

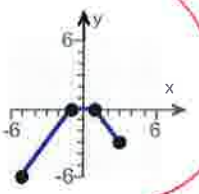
C. 

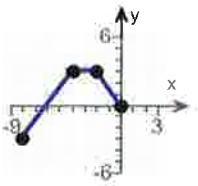
D. 

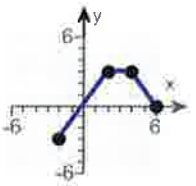
(d) Choose the correct graph of $H(x) = f(x + 1) - 3$ below.

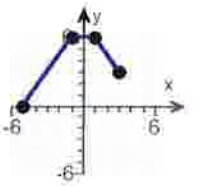
shift left −1

shift down −3

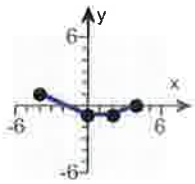
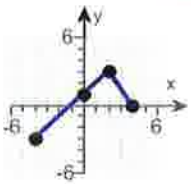
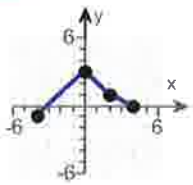
A. 

B. 

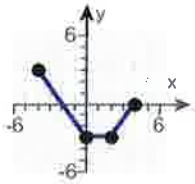
C. 

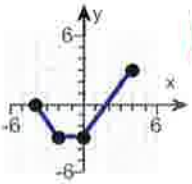
D. 

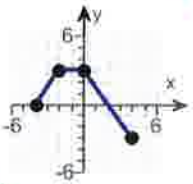
(e) Choose the correct graph of $Q(x) = \frac{1}{3}f(x)$ below.

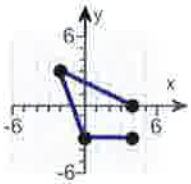





(f) Choose the correct graph of $g(x) = f(-x)$ below.

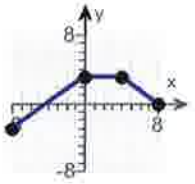
A. 

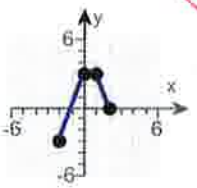
B. 

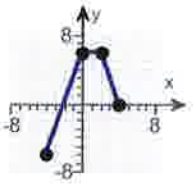
C. 

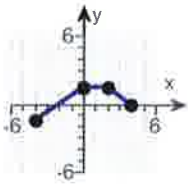
D. 

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

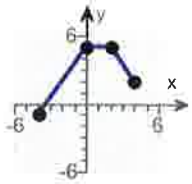
A. 

B. 

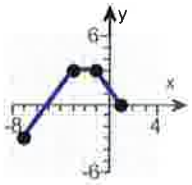
C. 

D. 

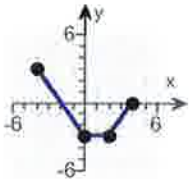
Answers



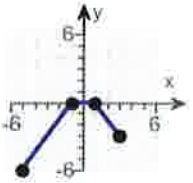
C.



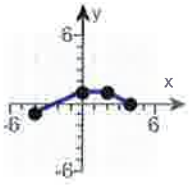
A.



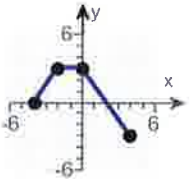
C.



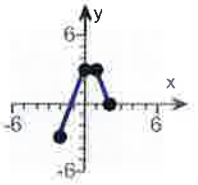
A.



D.



C.

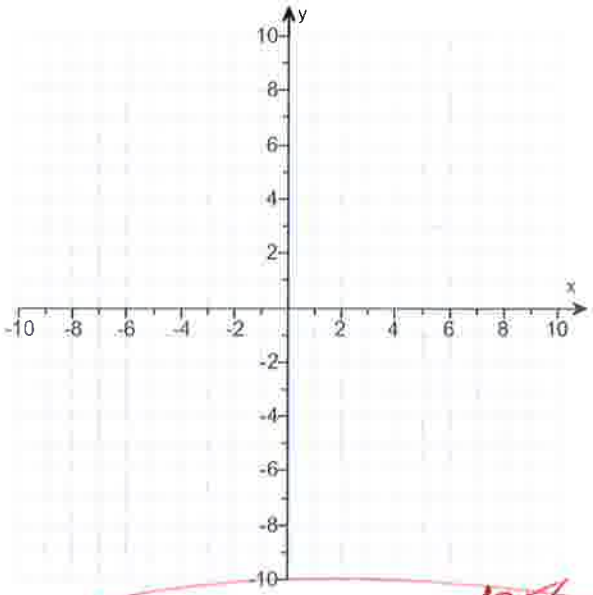


B.

ID: 1.5.63

11.

(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.

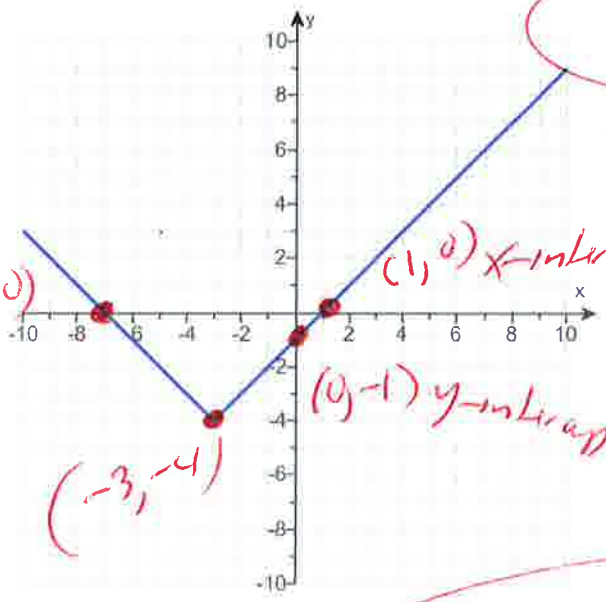


(a) Graph f(x).

(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.)

Answers



x-intercept (-7, 0)
(1, 0) x-intercept
(0, -1) y-intercept
(-3, -4)

f(x) = |x+3| − 4 BIG
shift left −3
shift down −4
use graphing calculator

y_1 = Math, Num, abs(
y_1 = abs(x+3) − 4

16

ID: 1.5.81

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

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

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

$g(x) = (x-5)^2 - 9$

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 8,2.

ID: 2.3.29

13. 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?

$f(x) = 8x^2 - 1 + 4x$

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 $\frac{-1+\sqrt{3}}{4}, \frac{-1-\sqrt{3}}{4}$.

ID: 2.3.47

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

$g(x) = x + 3\sqrt{x} - 10$

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 4.

ID: 2.3.75

$g(x) = x + 3\sqrt{x} - 10$

Let $x + 3\sqrt{x} - 10 = 0$

$x - 10 = -3\sqrt{x}$ rewrite

$(x-10)^2 = (-3\sqrt{x})^2$ square both sides

$(x-10)(x-10) = (-3\sqrt{x})(-3\sqrt{x})$

$x^2 - 10x - 10x + 100 = (-3)(-3)(\sqrt{x})(\sqrt{x})$

$x^2 - 20x + 100 = 9(\sqrt{x})^2$

$x^2 - 20x + 100 = 9(x)$

$x^2 - 20x + 100 = 9x$

$x^2 - 20x + 100 - 9x = 9x - 9x$

$x^2 - 29x + 100 = 0$

Possible
1 and 100
2 and 50
4 and 25
5 and 20
10 and 10

$(x-4)(x-25) = 0$

$x - 4 = 0$ OR $x - 25 = 0$

$x - 4 + 4 = 0 + 4$ OR $x - 25 + 25 = 0 + 25$

$x = 4$ OR $x = 25$

15. Check Try $x=4$

$x+3\sqrt{x}-10=0$

$(4)+3\sqrt{4}-10=0$

$4+3(2)-10=0$

$4+6-10=0$

$10-10=0$

$0=0$

Good

Try $x=25$

$x+3\sqrt{x}-10=0$

$(25)+3\sqrt{25}-10=0$

$25+3(5)-10=0$

$25+15-10=0$

$40-10=0$

$30\neq 0$

BAD

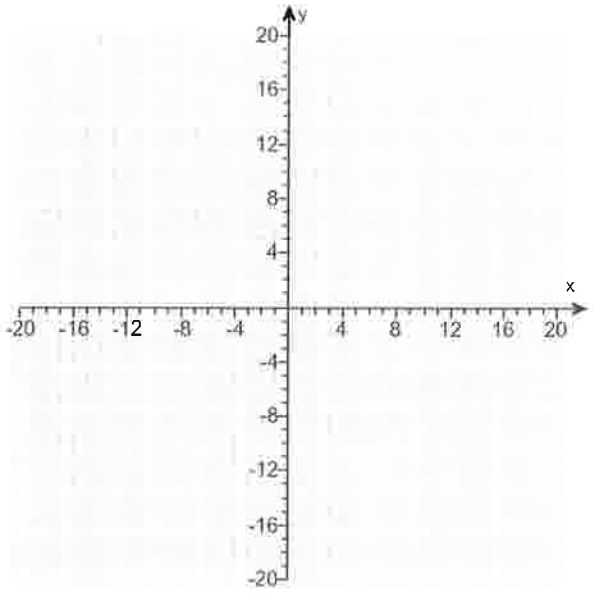
Answer

$x=4$

only

15

For the quadratic function $f(x) = x^2 + 2x - 8$, 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.)

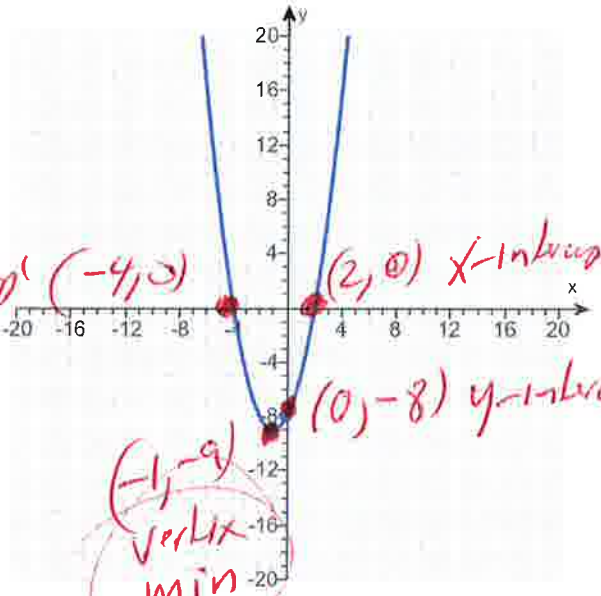
Answers up

(−1, −9)

x = −1

A. The x-intercept(s) is/are **−4,2** .
(Type an integer or a decimal. Use a comma to separate answers as needed.)

A. The y-intercept is **−8** .(Type an integer or a decimal.)



X-intercept (−4,0) (2,0) x-intercept

(0,−8) y-intercept

(−1,−9) vertex min

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

use graphing calculator

x	f(x)
−4	0
−1	−9
0	−8
2	0

vertex

(−∞,∞)

[−9,∞)

[−1,∞)

(−∞, −1]

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

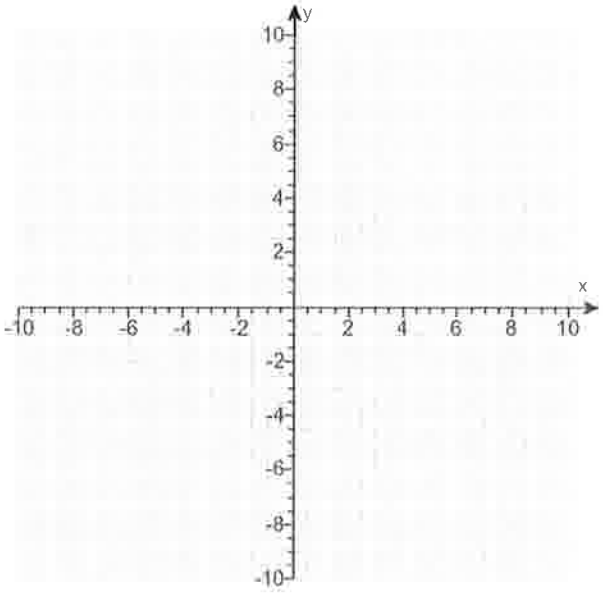
BIG

$y_1 = x^2 + 2x - 8$

ID: 2.4.37

16.

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.

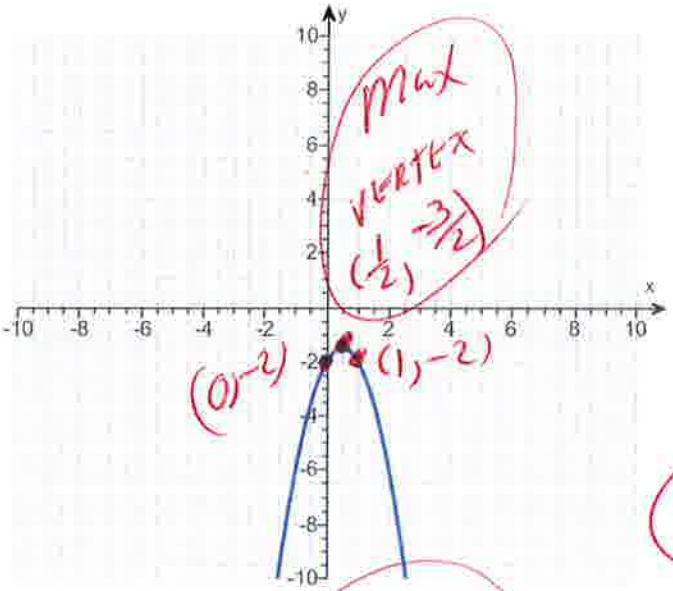
Answers (1) down.

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

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

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

B. There is no x-intercept.



$(-\infty, \infty)$

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

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

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

ID: 2.4.43

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

$f(x) = -3x^2 + 24x - 4$

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

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

What is this minimum or maximum value?

(Simplify your answer.)

Answers The function f has a maximum value.

44

ID: 2.4.59

18. 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.

$f(x) = x^3 + 7x^2 - 49x - 55$

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 = −11, −1, 5

(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.)

$(x + 1)(x + 11)(x - 5)$

ID: 3.2.45

19. Solve the equation in the complex number system.

$x^2 - 14x + 65 = 0$

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

Answer: $7-4i, 7+4i$

ID: 3.3.2

$x^2 - 14x + 65 = 0$

$a=1, b=-14, c=65$

$x = \frac{-(-14) \pm \sqrt{(-14)^2 - 4(1)(65)}}{2(1)}$

$x = \frac{14 \pm \sqrt{196 - 260}}{2}$

$x = \frac{14 \pm \sqrt{-64}}{2}$

$x = \frac{14 \pm 8i}{2}$

$x = \frac{14}{2} \pm \frac{8i}{2}$

$x = 7 \pm 4i$

$x = 7+4i, \ 7-4i$

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

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

$f(x) = x^3 - 8x^2 + 25x - 26$

Try $x = 2$

Possible Last / First: $\pm 26 / \pm 1$

$\pm 26, \pm 13, \pm 2, \pm 1$

	1	−8	25	−26
2		2	−12	26
	1	−6	13	0 rem

$x^2 - 6x + 13 = 0$

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 synthetic division

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 $2, 3-2i, 3+2i$

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

ID: 3.3.33

$x^2 - 6x + 13 = 0$

$a=1, b=-6, c=13$

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

$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(13)}}{2(1)}$

$x = \frac{6 \pm \sqrt{36 - 52}}{2}$

$x = \frac{6 \pm \sqrt{-16}}{2}$

$x = \frac{6 \pm 4i}{2}$

$x = \frac{6}{2} \pm \frac{4i}{2}$

$x = 3 \pm 2i$

$x = 3+2i$ or $x = 3-2i$

Examples formula:
$\sqrt{-1} = i$
$\sqrt{-4} = 2i$
$\sqrt{-9} = 3i$
$\sqrt{-16} = 4i$
$\sqrt{-25} = 5i$

Answer: $2, 3+2i, 3-2i$

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

$$R(x) = \frac{9x}{x+8}$$

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 = **9**.(Use a comma to separate answers as needed.)

B. There is no oblique asymptote.

ID: 3.4.45

$R(x) = \frac{9x}{1x+8}$

Set $1x+8=0$ ← Set Bottom Equal to Zero

$1x+8-8=0-8$

$1x=-8$

$x=-8$

Vertical asymptote $x=-8$

Since power on top equals power on the bottom then there is no oblique asymptote

Set $\frac{9x}{1x}$ = Highest Power Top / Highest Power bottom

Simplify $\frac{9}{1}$

$y=9$ horizontal asymptote

22. For $f(x) = 8x + 1$ and $g(x) = 5x$, 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 $40x + 1$

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

$40x + 5$

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

$64x + 9$

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

$25x$

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

ID: 4.1.23

goes here

22 a $f(x) = 8x+1$ and $g(x) = 5x$

composite

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

$f(g(x)) =$

$f(5x) =$

$8(5x)+1 =$

$40x+1 =$

domain

$(-\infty, \infty)$

goes here

22 b $f(x) = 8x+1$ and $g(x) = 5x$

composite

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

$g(f(x)) =$

$g(8x+1) =$

$5(8x+1) =$

$40x+5 =$

domain

$(-\infty, \infty)$

23

22 c $f(x) = 8x+1$ and $g(x) = 5x$

inside itself

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

$f(f(x)) =$

$f(8x+1) =$

$8(8x+1)+1$

$64x+8+1 =$

$64x+9 =$

Composite

Domain $(-\infty, \infty)$

22 d $f(x) = 8x+1$ and $g(x) = 5x$

inside itself

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

$g(5x) =$

$5(5x) =$

$25x =$

Composite

Domain $(-\infty, \infty)$

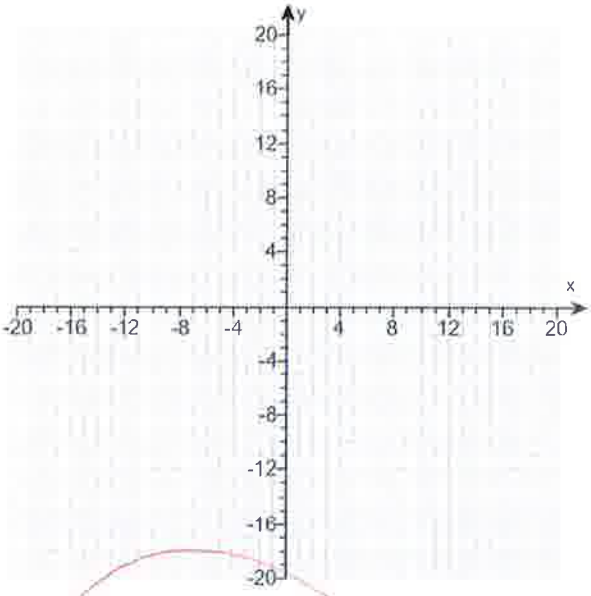
23.

The function $f(x) = 8x + 4$ 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 $\{x|x \leq$ _____ $\}$.
- B. The domain is $\{x|x \geq$ _____ $\}$.
- 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 $\{x|x \leq$ _____ $\}$.
- C. The domain is $\{x|x \neq$ _____ $\}$.
- 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 $\{y|y \geq$ _____ $\}$.
- B. The range is $\{y|y \leq$ _____ $\}$.
- 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.

$f(x) = 8x + 4$

Let $y =$

Inv var x-y

$x = 8y + 4$

Solve for y

$x - 4 = 8y + 4 - 4$

$x - 4 = 8y$

$\frac{x-4}{8} = \frac{8y}{8}$

$\frac{x-4}{8} = y$

$y = \frac{x-4}{8}$

Inverse

$f^{-1}(x) = \frac{x-4}{8}$

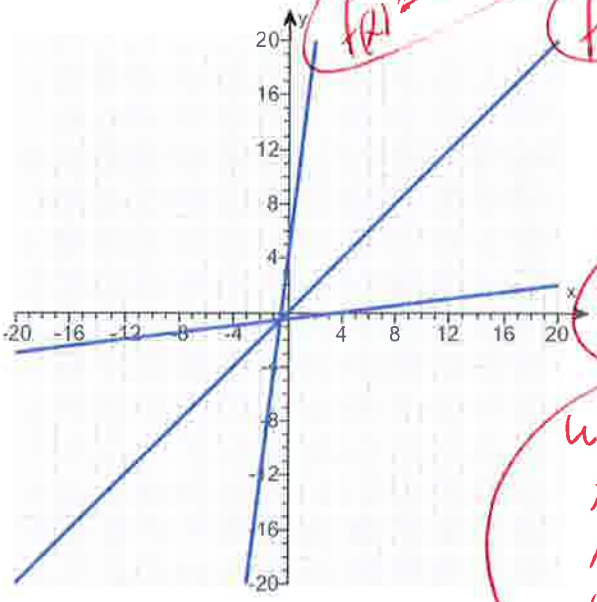
Answers $\frac{x-4}{8}$

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.



$y_1 = 8x+4$

$y_2 = x$

$y_3 = (x-4)/8$

$f(x) = 8x+4$

$f(x) = x$

$f^{-1}(x) = \frac{x-4}{8}$

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

ID: 4.2.53

24. Solve the equation.

$64^{-x+39} = 128^{x}$ → $(2^6)^{-x+39} = (2^7)^{x}$ rewrite

Primes 2, 3, 5, 7, 11, 13

2 | 128	2 | 64
2 | 64	2 | 32
2 | 32	2 | 16
2 | 16	2 | 8
2 | 8	2 | 4
2 | 4	2 | 2
2 | 2	1
1	

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

Answer: 18

$2^{-6x+234} = 2^{7x}$

$-6x+234 = 7x$

$-6x+234-234 = 7x-234$

$-6x = 7x-234$

$-6x-7x = 7x-234-7x$

$-13x = -234$

$\frac{-13x}{-13} = \frac{-234}{-13}$

$x = 18$

ID: 4.3.73

25. The function

$$D(h) = 6e^{-0.49h}$$

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 6 hours?

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

After 6 hours, there will be _____ milligrams. (Round to two decimal places as needed.)

Answers 3.68

0.32

ID: 4.3.111

Use graphing calculator

$D(1) = 6e^{(-0.49(1))} = 3.675758365$ OR $= 3.68$ Round

$D(6) = 6e^{(-0.045(6))} = 0.3171943724$ OR $= 0.32$ Round

26. Solve the equation.

$$\log_2(4x+5) = 5$$

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 $4x + 5 = 2^5$

$\frac{27}{4}$

ID: 4.4.91-Setup & Solve

$\log_2(4x+5) = 5$ → Rewrite

$2^5 = 4x+5$

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 4x+5$

$32 = 4x+5$

$32 - 5 = 4x + 5 - 5$

$27 = 4x$

$\frac{27}{4} = \frac{4x}{4}$

$\frac{27}{4} = x$

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

$$\ln\left(x^{12}\sqrt{7-x}\right),\ 0 < x < 7$$

$\ln\left(x^{12}\sqrt{7-x}\right) =$ _____ (Simplify your answer.)

Answer: $12\ln x + \frac{1}{2}\ln(7-x)$

ID: 4.5.47

Expand

formula: $\ln(AB) = \ln(A) + \ln(B)$, $\ln(A^N) = N\ln(A)$

$\ln\left(x^{12}\sqrt{7-x}\right) =$

$\ln\left(x^{12}(7-x)^{1/2}\right) =$ Rewrite

$\ln(x^{12}) + \ln(7-x)^{1/2} =$

$12\ln(x) + \frac{1}{2}\ln(7-x) =$

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

$$\log\left[\frac{x(x+7)}{(x+6)^{13}}\right],\ x>0$$

$$\log\left[\frac{x(x+7)}{(x+6)^{13}}\right] = \underline{\quad}$$ (Simplify your answer.)

Answer: $\log x + \log(x+7) - 13\log(x+6)$

ID: 4.5.51

29. Solve the logarithmic equation.

$$\log x + \log(x-48) = 2$$

Determine the equation to be solved after removing the logarithm.

$\underline{\quad}$

(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 $\{\underline{\quad}\}$.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

B. There is no solution.

Answers $x(x-48) = 10^2$

A. The solution set is $\{\ 50\ \}$.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

ID: 4.6.17-Setup & Solve

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

$300 invested at 3% compounded quarterly after a period of 2 years

After 2 years, the investment results in $\$\underline{\quad}$
(Round to the nearest cent as needed.)

Answer: 318.48

ID: 4.7.7

31. How long does it take for an investment to double in value if it is invested at 14% compounded quarterly? Compounded continuously?

At 14% compounded quarterly, the investment doubles in about _____ years.
(Round to two decimal places as needed.)

At 14% compounded continuously, the investment doubles in about _____ years.
(Round to two decimal places as needed.)

Answers 5.04
4.95

ID: 4.7.35

32. How many years will it take for an initial investment of $20,000 to grow to $50,000? Assume a rate of interest of 5% compounded continuously.

It will take about _____ years for the investment to grow to $50,000.
(Round to two decimal places as needed.)

Answer: 18.33

ID: 4.7.41

33. The half-life of carbon-14 is 5600 years. If a piece of charcoal made from the wood of a tree shows only 74% 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: 2433

ID: 4.8.11

34. 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 20 days, and 40 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 48 days?

The population in 48 days will be _____.
(Round to the nearest integer as needed.)

(c) When will the population reach 560?

The population will reach 560 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

$40(3)^{\frac{t}{20}}$

559

48.0

$40e^{0.055t}$

ID: 4.8.32-GC

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

$$\begin{cases} 4x - 4y = 4 \\ 5x + y = 17 \end{cases}$$

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 $\{(x,y) \mid x = \_\_\_\_\_, \text{ y any real number}\}$.
  (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 = 3 and y = 2.
(Type an integers or simplified fractions.)

ID: 6.1.33

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

$$\begin{cases} x - 2y + 3z = 10 \\ 2x + y + z = 0 \\ -3x + 2y - 2z = -5 \end{cases}$$

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 $\{(x,y,z) \mid x = \_\_\_\_\_, y = \_\_\_\_\_, \text{ z any real number}\}$.
  (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 $\{(x,y,z) \mid x = \_\_\_\_\_, \text{ y any real number, z any real number}\}$.
  (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 = 3. (Type integers or simplified fractions.)

ID: 6.1.45

exponential growth