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

Student: _____	Instructor: Alfredo Alvarez	Assignment:
Date: _____	Course: Math 1314 Sullivan Coreq	finalm1314COC026sulllljjRZZ06

1. Solve the inequality $16 - 3x < 10$. Graph the solution set.

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

   Graph the solution set. Choose the correct graph below.

   A.   B.

   C.   D.

   Answers x > 2

   C.
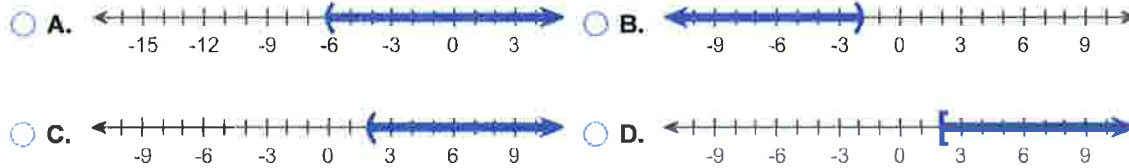
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$$16 - 3x < 10$$

$$\cancel{16} - 3x - \cancel{16} < 10 - 16$$

$$-3x < -6$$

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

$$\boxed{x > 2}$$

$$\longleftrightarrow\!\!\!\!2\!\!\longrightarrow$$

$$(2, \infty)$$

2. Find the following for the function $f(x) = 4x^2 + 4x - 4$.

(a) f(0)   **(b)** f(1)   **(c)** f(-1)   **(d)** f(-x)
(e) -f(x)   **(f)** f(x+1)   **(g)** f(3x)   **(h)** f(x+h)

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

(b) f(1) = [   ] (Simplify your answer.)

(c) f(-1) = [   ] (Simplify your answer.)

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

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

(f) f(x+1) = [   ] (Simplify your answer.)

(g) f(3x) = [   ] (Simplify your answer.)

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

Answers -4

4

-4

$4x^2 - 4x - 4$

$-4x^2 - 4x + 4$

$4x^2 + 12x + 4$

$36x^2 + 12x - 4$

$4x^2 + 8hx + 4h^2 + 4x + 4h - 4$

ID: 1.1.43

(2) a

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

$$f(0) = 4(0)^2 + 4(0) - 4$$

$$f(0) = 4(0)(0) + 4(0) - 4$$

$$f(0) = 4(0) + 4(0) - 4$$

$$f(0) = 0 + 0 - 4$$

$$f(0) = 0 - 4$$

$$f(0) = -4 ✓$$

(2) b

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

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

$$f(1) = 4(1)(1) + 4(1) - 4$$

$$f(1) = 4(1) + 4(1) - 4$$

$$f(1) = 4 + 4 - 4$$

$$f(1) = 8 - 4$$

$$f(1) = 4 ✓$$

(2) c

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

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

$$f(-1) = 4(-1)(-1) + 4(-1) - 4$$

$$f(-1) = 4(1) + 4(-1) - 4$$

$$f(-1) = 4 - 4 - 4$$

$$f(-1) = 0 - 4 \quad \checkmark\checkmark$$

$$f(-1) = -4$$

(2) d

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

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

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

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

$$f(-x) = 4x^2 - 4x - 4 \quad \checkmark\checkmark$$

② e

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

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

$$-f(x) = -4x^2 - 4x + 4 \quad \checkmark$$

② f

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

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

$$f(x+1) = 4(x+1)(x+1) + 4(x+1) - 4$$

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

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

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

$$f(x+1) = 4x^2 + 12x + 4 \quad \checkmark$$

(2) g

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

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

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

$$f(3x) = 4(9x^2) + 4(3x) - 4$$

$$f(3x) = 36x^2 + 12x - 4$$

(2) h

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

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

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

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

$$f(x+h) = 4(x^2 + 2xh + h^2) + 4(x+h) - 4$$

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

3. Find the domain of the function.

$$f(x) = \sqrt{5x - 25}$$

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

Answer: [5, ∞)

ID: 1.1.59

$$f(x) = \sqrt{5x - 25}$$

set $5x - 25 \geq 0$

$5x - 25 + 25 \geq 0 + 25$

$5x \geq 25$

$\dfrac{5x}{5} \geq \dfrac{25}{5}$

$x \geq 5$

$\Rightarrow$

5

$[5, \infty)$

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

set $Ax + B \geq 0$

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

   $f(x) = 5x + 9$; $g(x) = 9x - 2$

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

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

   handwritten:
   $f(x) + g(x) =$
   $(5x + 9) + (9x - 2) =$
   $5x + 9 + 9x - 2 =$
   $14x + 7 =$
   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$\}$.

   handwritten:
   $f(x) - g(x) =$
   $(5x + 9) - (9x - 2) =$
   $5x + 9 - 9x + 2 =$
   $-4x + 11 =$
   domain $(-\infty, \infty)$

   (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$\}$.

   handwritten:
   $(f \cdot g)(x) =$
   $f(x) \cdot g(x) =$
   $(5x + 9)(9x - 2) =$
   $45x^2 - 10x + 81x - 18 =$
   $45x^2 + 71x - 18 =$
   domain $(-\infty, \infty)$

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

   $(f \cdot 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$\}$.

   handwritten:
   $\left(\dfrac{f}{g}\right)(x) =$
   $\dfrac{f(x)}{g(x)} =$
   $\dfrac{5x + 9}{9x - 2}$
   domain $x \neq \frac{2}{9}$
   $9x - 2 = 0$
   $9x - 2 + 2 = 0 + 2$
   $9x = 2$
   $\frac{9x}{9} = \frac{2}{9}$
   $x = \frac{2}{9}$

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

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

   What is the domain of $\dfrac{f}{g}$? 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$\}$.

   handwritten:
   $(f + g)(x) = 14x + 7$
   $(f + g)(3) = 14(3) + 7$
   $(f + g)(3) = 42 + 7$
   $(f + g)(3) = 49$

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

$(f + g)(3) =$ ☐ (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 $\left(\dfrac{f}{g}\right)(1)$.

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

Answers 14x + 7

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

$-4x + 11$

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

$45x^2 + 71x - 18$

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

$\dfrac{5x + 9}{9x - 2}$

    A. The domain is $\left\{ x \middle| \boxed{x \neq \dfrac{2}{9}} \right\}$.

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

49

3

986

2

ID: 1.1.67

Handwritten work:

$(f - g)(x) = -4x + 11$

$(f - g)(2) = -4(2) + 11$

$(f - g)(2) = -8 + 11$

$(f - g)(2) = 3$ ✓

$(f \cdot g)(x) = 45x^2 + 71x - 18$

$(f \cdot g)(4) = 45(4)^2 + 71(4) - 18$

$(f \cdot g)(4) = 45(4)(4) + 71(4) - 18$

$(f \cdot g)(4) = 45(16) + 71(4) - 18$

$(f \cdot g)(4) = 720 + 284 - 18$

$(f \cdot g)(4) = 986$ ✓

$\left(\dfrac{f}{g}\right)(x) = \dfrac{5x + 9}{9x - 2}$

$\left(\dfrac{f}{g}\right)(1) = \dfrac{5(1) + 9}{9(1) - 2}$

$\left(\dfrac{f}{g}\right)(1) = \dfrac{5 + 9}{9 - 2}$

$\left(\dfrac{f}{g}\right)(1) = \dfrac{14}{7}$

$\dfrac{f}{g}(1) = 2$

5.
Find the difference quotient of f; that is, find $\dfrac{f(x + h) - f(x)}{h}$, $h \neq 0$, for the following function. Be sure to simplify.

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

$\dfrac{f(x + h) - f(x)}{h} =$ ☐

Answer: $2x + h - 8$

ID: 1.1.83

Handwritten work:

$\dfrac{\left((x+h)^2 - 8(x+h) + 7\right) - (x^2 - 8x + 7)}{h} =$

$\dfrac{(x+h)(x+h) - 8x - 8h + 7 - x^2 + 8x - 7}{h} =$

$\dfrac{x^2 + xh + xh + h^2 - 8x - 8h + 7 - x^2 + 8x - 7}{h} =$

$\dfrac{x^2 + 2xh + h^2 - 8x - 8h + 7 - x^2 + 8x - 7}{h} =$

$\dfrac{2xh + h^2 - 8h}{h} = \dfrac{2xh}{h} + \dfrac{h^2}{h} - \dfrac{8h}{h} = 2x + h - 8$

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

   (a) the domain and range
   (b) the intercepts, if any
   (c) any symmetry with respect to the x-axis, y-axis, or the origin

[Handwritten annotations on graph: "open circle", "(−3,4)", "(−1, 0)"]
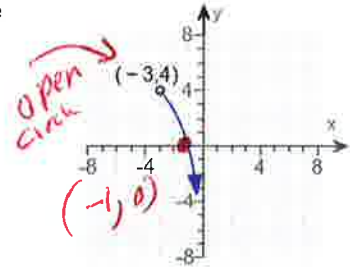
Does the graph represent a function? Choose the correct answer below.

○ A. Yes, the graph is a function because every vertical line intersects the graph in more than one point.

○ B. No, the graph is not a function because a vertical line x = − 2 intersects the graph at only one point.

● C. Yes, the graph is a function because every vertical line intersects the graph in at most one point.

○ D. No, the graph is not a function because a vertical line x = − 2 intersects the graph at two points.

(a) What are the domain and range of the function? Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice. *(Left, right)*

● A. The domain is $(-3, 0)$. The range is $(-\infty, 4)$ *(bottom, Top)*
   (Type your answers in interval notation. Use integers or fractions for any numbers in the expressions.)

○ B. The graph is not that of a function.

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

● A. The intercept(s) is/are $(-1, 0)$ *x-intercept*
   (Type an ordered pair. Use a comma to separate answers as needed.)

○ B. There are no intercepts.

○ C. The graph is not that of a function.

(c) Determine if the graph is symmetric with respect to the x-axis, y-axis, or the origin. Select all that apply.

☐ A. The graph is symmetric with respect to the origin.

☐ B. The graph is symmetric with respect to the y-axis.

☐ C. The graph is symmetric with respect to the x-axis.

☑ D. The graph has no symmetry.

☐ E. The graph is not that of a function.

Answers C. Yes, the graph is a function because every vertical line intersects the graph in at most one point.

A. The domain is $\boxed{(-3,0)}$. The range is $\boxed{(-\infty,4)}$.

(Type your answers in interval notation. Use integers or fractions for any numbers in the expressions.)
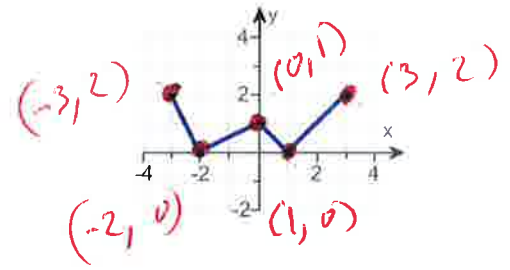
A. The intercept(s) is/are $\boxed{(-1,0)}$.(Type an ordered pair. Use a comma to separate answers as needed.)

D. The graph has no symmetry.

ID: 1.2.19

7. 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

$(-3, 2)$ $(0, 1)$ $(3, 2)$

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

x-intercept

(a) What are the intercepts?

x-intercept   y-intercept

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

(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 $[0, 2]$ ← [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 $(-2, 0], [1, 3]$
    (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 $[-3, -2], [0, 1]$
    (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 $(-2,0),(1,0),(0,1)$

$[-3,3]$

$[0,2]$

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

A. The graph is decreasing on $[-3,-2],[0,1]$.
(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

8. The function f is defined as follows.

$$f(x) = \begin{cases} -2x + 5 & \text{if } x < 1 \\ 4x - 1 & \text{if } x \geq 1 \end{cases}$$

(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 $\boxed{(-\infty, \infty)}$ ← (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 $\boxed{(0,5)}$ ← 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.
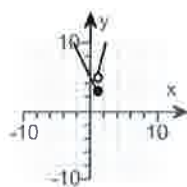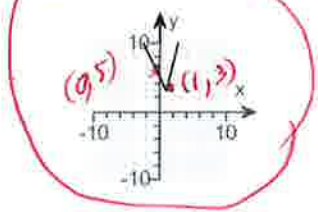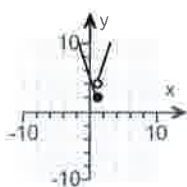
○ **A.**   ○ **B.** (0,5) (1,3)   ○ **C.**   ○ **D.**
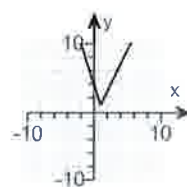
(d) The range of the function f is $\boxed{[3, \infty)}$ ← [bottom, TOP]
(Type your answer in interval notation.)

Answers $(-\infty, \infty)$

A. The intercept(s) is/are $\boxed{(0,5)}$.
(Type an ordered pair. Use a comma to separate answers as needed.)   use
graphing
calculator

B.

$[3, \infty)$
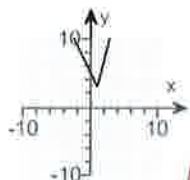
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windows
X-min = -12
X-max = 12
y-min = -10
y-max = 10

little
$y_1 = -2x + 5 \div (x < 1)$ OPEN circle
2ND math

$y_2 = 4x - 1 \div (x \geq 1)$ close circle
BIG

9. 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.
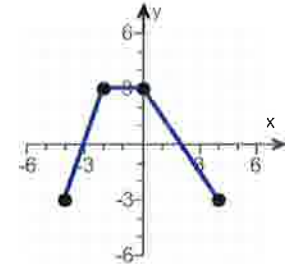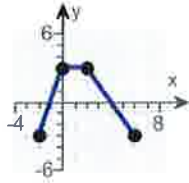
(a) $F(x) = f(x) + 2$

(b) $G(x) = f(x + 2)$

(c) $P(x) = -f(x)$

(d) $H(x) = f(x + 1) - 1$

(e) $Q(x) = \frac{1}{3}f(x)$

(f) $g(x) = f(-x)$

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

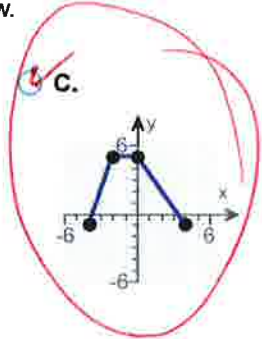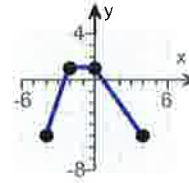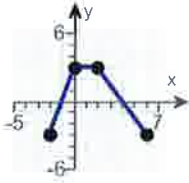(a) Choose the correct graph of $F(x) = f(x) + 2$ below.
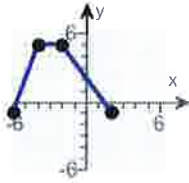
○ A.   ○ B.   ◉ C.   ○ D.
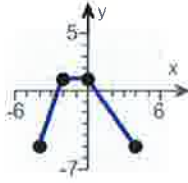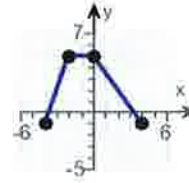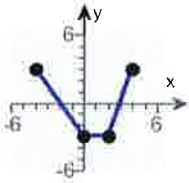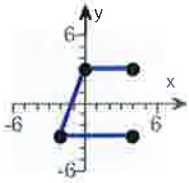
(b) Choose the correct graph of $G(x) = f(x + 2)$ below.

◉ A.   ○ B.   ○ C.   ○ D.

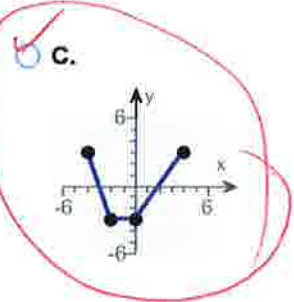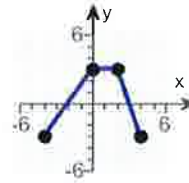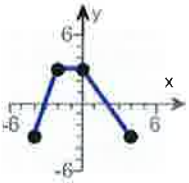(c) Choose the correct graph of $P(x) = -f(x)$ below.

○ A.   ○ B.   ◉ C.   ○ D.

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

○ A.   ○ B.   ◉ C.   ○ D.

(e) Choose the correct graph of $Q(x) = \frac{1}{3}f(x)$ below.
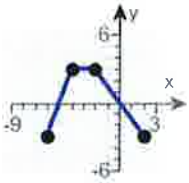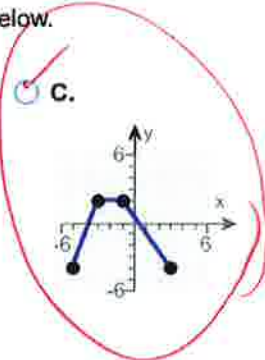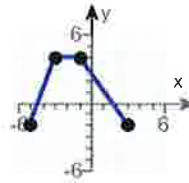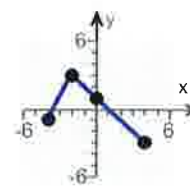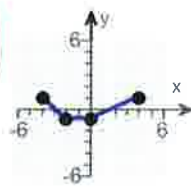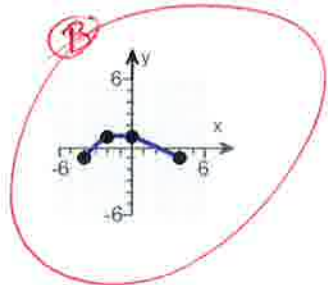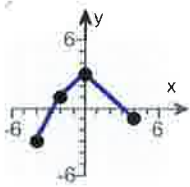
(f) Choose the correct graph of g(x) = f(− x) below.
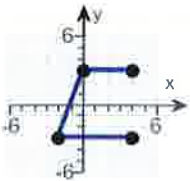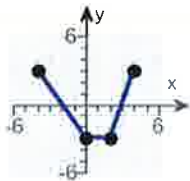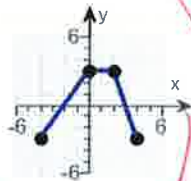
A. B. C. D.

(g) Choose the correct graph of h(x) = f(2x) below.
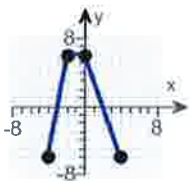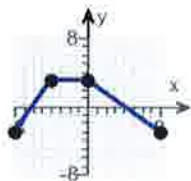
A. B. C. D.
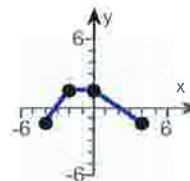
Answers
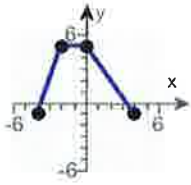
C.
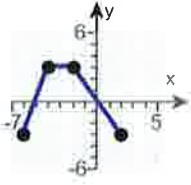
A.
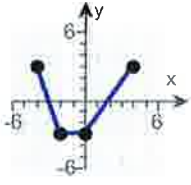
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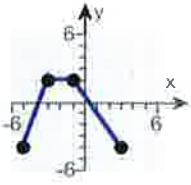
C.
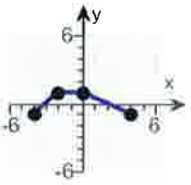
B.
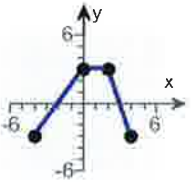
C.
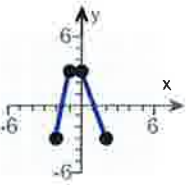
A.

ID: 1.5.63

10.

(a) Graph $f(x) = |x + 5| - 3$ 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

9

ID: 1.5.81

(handwritten annotations)

x-intercept
$(-8, 0)$ $(-3, 0)$ $(0, 2)$ y-intercept
$(-5, -3)$
x-intercept
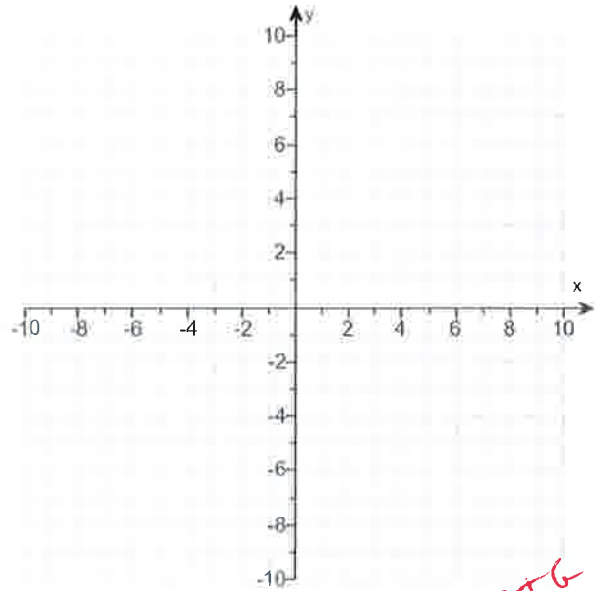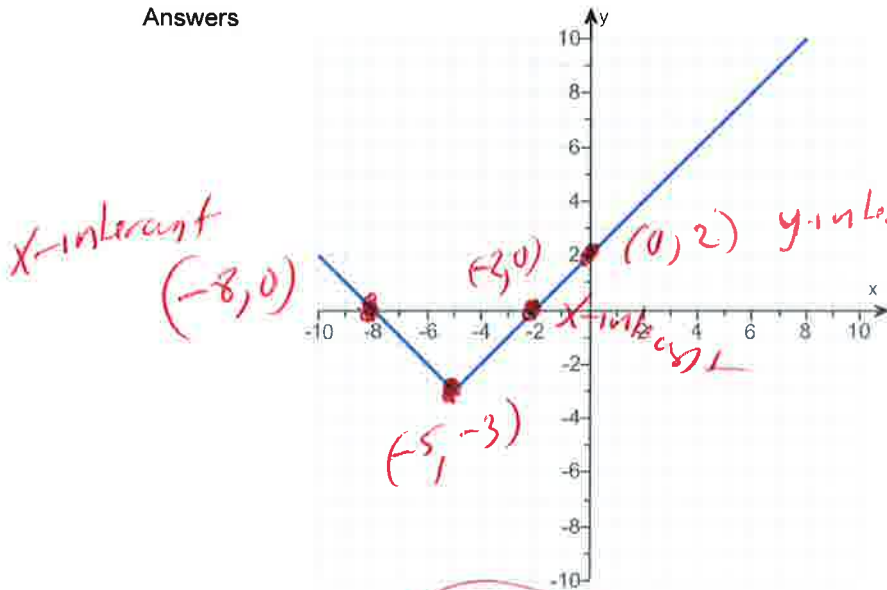
$f(x) = |x + 5| - 3$ BIG
Shift left -5 OPPOSITE
Shift down -3

use graphing calculator

$y_1 = $ Math, Num, abs

X	(X)
-8	0
-5	-3
-2	0
0	2

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

$y_1 = abs(X + 5) - 3$ BIG

$(x-1)^2 - 36 = 0$

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

$(x-1)^2 = 36$ rewrite

$$g(x) = (x-1)^2 - 36$$

$\sqrt{(x-1)^2} = \pm\sqrt{36}$

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.)

$x - 1 = \pm 6$

○ **A.** The zeros and the x-intercepts are the same. They are ___

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

○ **B.** The zeros and the x-intercepts are different. The zeros are ___, the x-intercepts are ___

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

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

Answer: A. The zeros and the x-intercepts are the same. They are | $7, -5$ |.

ID: 2.3.29

12. 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?

$f(x) = 8x^2 + 4x - 3$ rewrite

$$f(x) = 8x^2 - 3 + 4x$$

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 $\dfrac{-1+\sqrt{7}}{4}, \dfrac{-1-\sqrt{7}}{4}$.

ID: 2.3.47

$f(x) = 8x^2 + 4x - 3$

$a = 8, \quad b = 4, \quad c = -3$

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

13.

$$x = \frac{-(4) \pm \sqrt{(4)^2 - 4(8)(-3)}}{2(8)}$$

$$x = \frac{-4 \pm \sqrt{16 + 96}}{16}$$

$$x = \frac{-4 \pm \sqrt{112}}{16}$$

$$x = \frac{-4 \pm \sqrt{16 \cdot 7}}{16}$$

rewrite

$$x = \frac{-4 \pm \sqrt{16}\sqrt{7}}{16}$$

$$x = \frac{-4 \pm 4\sqrt{7}}{16}$$

$$x = \frac{4(-1 \pm 1\sqrt{7})}{4(4)}$$

factor

$$x = \frac{-1 \pm 1\sqrt{7}}{4}$$

simplify

$$x = \frac{-1 \pm \sqrt{7}}{4}$$

use graphs
Calculate

Primes
2,3,5,7,11,13,17...

16

7

2	112
2	56
2	28
2	14
7	7
	1
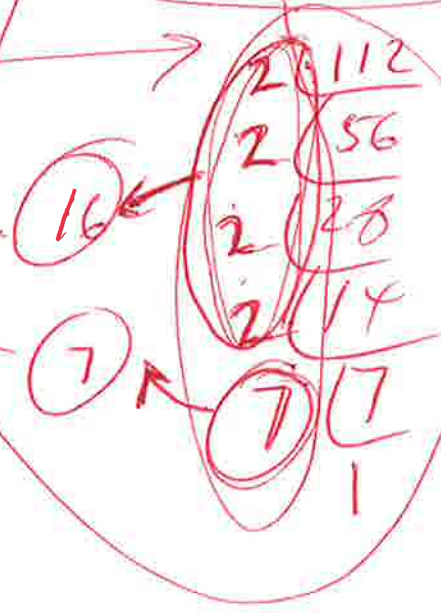
$$x = \frac{-1 + \sqrt{7}}{4} \quad OR \quad x = \frac{-1 - \sqrt{7}}{4}$$

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 (−2,0)   (4,0) X-intercept

y-intercept (0,−8)   (1,−9)
                       vertex
                       min

(− ∞,∞)

[− 9,∞)

[1,∞)

(− ∞,1]

ID: 2.4.37

use graphy
Calculate
$f(x) = x^2 - 2x - 8$

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

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

X	f(x)
−2	0
0	−8
1	−9	← vertex
4	0

(handwritten) MAX = Vertex = $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$ formula

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

(handwritten) A negative means graph opens down so it has a MAX

(handwritten) $f(x) = -3x^2 + 6x - 9$ $a = -3, b = 6, c = -9$

$$f(x) = -3x^2 + 6x - 9$$

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

○ The function f has a maximum value. *(handwritten)* Vertex $= \left(-\frac{6}{2(-3)}, f\frac{-(6)}{2(-3)}\right)$

○ The function f has a minimum value.

(handwritten) Vertex $= \left(\frac{-6}{-6}, f\left(\frac{-6}{-6}\right)\right)$

What is this minimum or maximum value?

(handwritten) Vertex $= (1, f(1))$

[_____]

(Simplify your answer.) *(handwritten)* Vertex $= (1, -3(1)^2 + 6(1) - 9)$

Answers The function f has a maximum value.

(handwritten) Vertex $= (1, -3(1)(1) + 6(1) - 9)$

−6   *(handwritten)* Vertex $= (1, -3 + 6 - 9)$

(handwritten, boxed) Vertex $(1, -6)$ Max   What value (1, −6)

ID: 2.4.59   *(handwritten)* Vertex $= (1, -6)$

---

15. 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.

(handwritten) $f(x) = 1x^3 - 1x^2 - 37x - 35$ use synthetic division

(handwritten) Possible ± 35 last, ± 1 first

$$f(x) = x^3 - x^2 - 37x - 35$$

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

(handwritten) $\pm 35, \pm 7, \pm 5, \pm 1$ over ± 1

(handwritten synthetic) try $x = -1$ | 1 −1 −37 −35 ... −1 2 35 ... 1 −2 −35   theorem

○ **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.)

(handwritten) $\frac{\pm 35}{1}, \frac{\pm 7}{1}, \frac{\pm 5}{1}, \frac{\pm 1}{1}$

(handwritten, circled) $\pm 35, \pm 7, \pm 5, \pm 1$

○ **B.** There are no real zeros.

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

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

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.)

(handwritten) Let $x + 5 = 0$ OR $x - 7 = 0$

Answers A. x = [**−5, −1, 7**]   *(handwritten)* $x + 5 - 5 = 0 - 5$ OR $x - 7 + 7 = 0 + 7$

(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 − 7)   *(handwritten, circled)* $x = -5$ or $x = 7$

ID: 3.2.45   *(handwritten)* answer

(handwritten, boxed) −1, −5, 7

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

$$R(x) = \frac{11x}{x + 16}$$

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 = [− 16] .(Use a comma to separate answers as needed.)

    A. The horizontal asymptote(s) is/are y = [11] .(Use a comma to separate answers as needed.)

    B. There is no oblique asymptote.

ID: 3.4.45

$$R(x) = \frac{11x}{x+16}$$

Set Bottom equal to zero

Let $X+16 = 0$ ← (Bottom equal to zero)

$X+16-16 = 0+16$ ← (Solve for x)

$X = -16$

vertical asymptote

(Highest)

Since powers top and bottom are same then is no Oblique asymptote

$$\frac{11x}{1x} = \frac{\text{highest power top}}{\text{highest power bottom}}$$

$$\frac{11}{1} = \qquad \boxed{y = 11}$$

Horizontal asymptote

$11 =$

17. For f(x) = 4x + 7 and g(x) = 2x, find the following composite functions and state the domain of each.

(a) f ∘ g   (b) g ∘ f   (c) f ∘ f   (d) g ∘ g

(a) (f ∘ g)(x) = [_____]   (Simplify your answer.)

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

○ **A.** The domain of f ∘ g is {x | [_____] }.
    (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 ∘ g is all real numbers.

(b) (g ∘ f)(x) = [_____]   (Simplify your answer.)

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

○ **A.** The domain of g ∘ f is {x | [_____] }.
    (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 ∘ f is all real numbers.

(c) (f ∘ f)(x) = [_____]   (Simplify your answer.)

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

○ **A.** The domain of f ∘ f is {x | [_____] }.
    (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 ∘ f is all real numbers.

(d) (g ∘ g)(x) = [_____]   (Simplify your answer.)

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

○ **A.** The domain of g ∘ g is {x | [_____] }.
    (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 ∘ g is all real numbers.

Answers 8x + 7

    B. The domain of f ∘ g is all real numbers.

    8x + 14

    B. The domain of g ∘ f is all real numbers.

    16x + 35

    B. The domain of f ∘ f is all real numbers.

    4x

    B. The domain of g ∘ g is all real numbers.

ID: 4.1.23

$$f(x) = 4x + 7 \text{ and } g(x) = 2x$$

$$(f \circ g)(x) =$$
$$f(g(x)) =$$
$$f(2x) =$$
$$4(2x) + 7 =$$
$$8x + 7 =$$

domain
$$(-\infty, \infty)$$

$$f(x) = 4x + 7 \text{ and } g(x) = 2x$$

$$(g \circ f)(x) =$$
$$g(f(x)) =$$
$$g(4x + 7) =$$
$$2(4x + 7) =$$
$$8x + 14 =$$

domain
$$(-\infty, \infty)$$

$f(x) = 4x + 7$ and $g(x) = 2x$

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

$f(f(x)) =$

$f(4x+7) =$

$4(4x+7) + 7 =$

$16x + 28 + 7 =$

$\boxed{16x + 35} =$

domain
$(-\infty, \infty)$

$f(x) = 4x + 7$ and $g(x) = 2x$

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

$g(g(x)) =$

$g(2x) =$

$2(2x) = \checkmark$

$\boxed{4x} =$

domain
$(-\infty, \infty)$

16.

The function $f(x) = 5x - 1$ 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) $f^{-1}(x) = \boxed{}$
(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 $\{x | x \le \underline{}\}$.
- B. The domain is $\{x | x \ne \underline{}\}$.
- C. The domain is $\{x | x \ge \underline{}\}$.
- 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 $\{y | y \ge \underline{}\}$.
- B. The range is $\{y | y \le \underline{}\}$.
- C. The range is $\{y | y \ne \underline{}\}$.
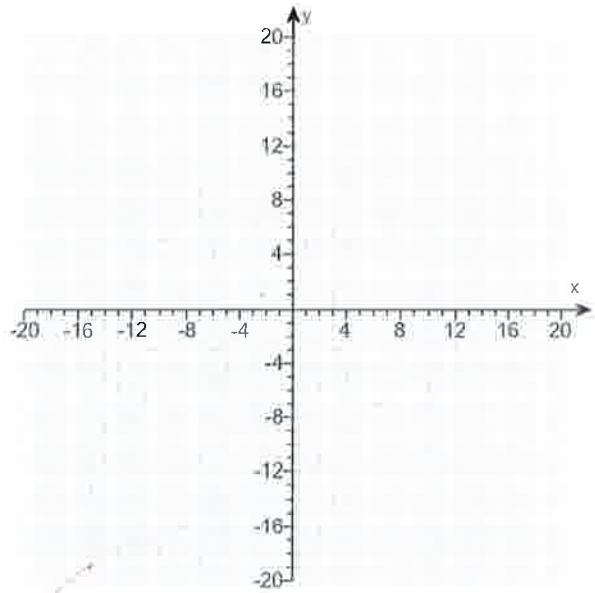- D. The range is the set of all real numbers.

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 $\{x | x \ne \underline{}\}$.
- B. The domain is $\{x | x \ge \underline{}\}$.
- C. The domain is $\{x | x \le \underline{}\}$.
- 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 $\{y | y \ge \underline{}\}$.
- B. The range is $\{y | y \ne \underline{}\}$.
- C. The range is $\{y | y \le \underline{}\}$.
- 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.

$f(x) = 5x - 1$

$y = 5x - 1$ set y =

$x = 5y - 1$ solve for y

$x + 1 = 5y$

$\dfrac{x+1}{5} = y$

$y = \dfrac{x+1}{5}$ rewrite

$f^{-1}(x) = \dfrac{x+1}{5}$ inverse

Answers $\dfrac{x+1}{5}$

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.
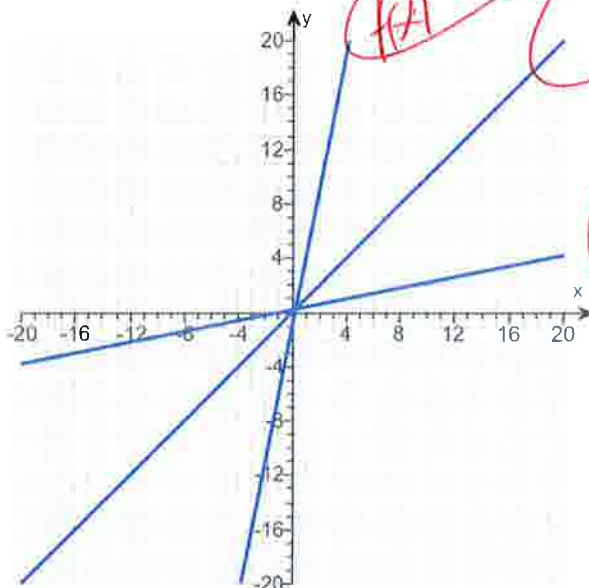
$f(x) = 5x - 1$

$f(x) = x$

$f^{-1}(x) = \dfrac{x+1}{5}$

ID: 4.2.53

19. Solve the equation.

$$4^{-x+21} = 32^x$$

$\left(2^2\right)^{-x+21} = \left(2^5\right)^x$ rewrite

The solution set is { ⬚ }.

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

Answer: 6

$$2^{-2x+42} = 2^{5x}$$

$$-2x + 42 = 5x$$

$$-2x + 42 - 42 = 5x - 42$$

$$-2x = 5x - 42$$

$$-2x - 5x = 5x - 42 - 5x$$

$$-7x = -42$$

$$\dfrac{-7x}{-7} = \dfrac{-42}{-7}$$

$$x = 6$$

ID: 4.3.73

$4 = 2 \cdot 2$

$32 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

20. Solve the equation.

$\log_2(8x+3) = 4$

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 $8x + 3 = 2^4$

$\dfrac{13}{8}$

ID: 4.4.91-Setup & Solve

Handwritten work:
$\log_2(8x+3) = 4$ ← rewrite
$2^4 = 8x+3$
$2 \cdot 2 \cdot 2 \cdot 2 = 8x+3$
$16 = 8x+3$
$16-3 = 8x+3-3$
$13 = 8x$
$\dfrac{13}{8} = \dfrac{8x}{8}$
$\dfrac{13}{8} = x$

21. Solve the logarithmic equation.

$\log x + \log(x+21) = 2$

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 $x(x+21) = 10^2$

A. The solution set is { 4 }.
(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

ID: 4.6.17-Setup & Solve

Handwritten work:
$\log_{10}(x)(x+21) = 2$ ← rewrite
$10^2 = x(x+21)$
$100 = x^2 + 21x$
$0 = x^2 + 21x - 100$
$0 = (x-4)(x+25)$
$x-4 = 0$ OR $x+25 = 0$
$x-4+4 = 0+4$ OR $x+25-25 = 0-25$
$x = 4$ OR $x = -25$
Check
$\log(4) + \log(4+21) = 2$
$\log(4) + \log(25) = 2$ good
$\log(-25) + \log(-25+21) = 2$
$\log(-25) + \log(-4) = 2$ BAD BAD
formula $\log(A) + \log(B) = \log(AB)$
$X = 4$ only
answer $X = 4$ only

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

$600 invested at 6% compounded quarterly after a period of 2 years

After 2 years, the investment results in $ [　　　　]
(Round to the nearest cent as needed.)

Answer: 675.90

ID: 4.7.7

Handwritten work:
$A = P\left(1+\dfrac{r}{N}\right)^{Nt}$
$P = 600$
$r = 6\% = .06$
$N = 4 = $ Quarterly
$t = 2 = $ years
$A = 600\left(1+\dfrac{.06}{4}\right)^{4(2)}$
$A = 600\left(1+\dfrac{.06}{4}\right)^8$
$A = 600(1+.06/4)^8$
$A = 675.895532$ OR
$A = 675.90$ Round

Handwritten at top: Let f(ω) → 2ω $A = P(1+\frac{r}{2})^{Nt}$ $A = Pe^{rt}$ formula

23. How long does it take for an investment to double in value if it is invested at 10% compounded quarterly? Compounded continuously?

Handwritten: $2ω = 100(1+\frac{.10}{4})^{4t}$ $200 = 100e^{.10t}$

At 10% compounded quarterly, the investment doubles in about ☐ years.
(Round to two decimal places as needed.)

At 10% compounded continuously, the investment doubles in about ☐ years.
(Round to two decimal places as needed.)

Handwritten work: $\frac{200}{100} = \frac{100(1+\frac{ω}{4})^{4t}}{100}$ $\frac{\ln(2)}{4\ln(1+.\frac{1}{4})} = \frac{-4t\ln(1+.\frac{1}{4})}{}$ $7.017958631 = t$ $\ln(2)=\ln(e^{.10t})$

Answers 7.02 $2 = (1+\frac{.10}{4})^{4t}$

6.93 $\ln(2) = \ln(1+\frac{.10}{4})^{4t}$ $7.02 = t$ $\frac{\ln(2)}{.10} $ OR $6.93 = t$

$\ln(2) = 4t\ln(1+\frac{.10}{4})$ $6.931471806 = t$ Round

ID: 4.7.35

24. How many years will it take for an initial investment of $10,000 to grow to $25,000? Assume a rate of interest of 15% compounded continuously.

Handwritten: $A = Pe^{rt}$ $\ln(2.5) = \ln(e^{.15t})$ $\ln(2.5) = .15t(\ln e)$

It will take about ☐ years for the investment to grow to $25,000.
(Round to two decimal places as needed.)

Handwritten: $25000 = 10000e^{.15t}$ $\ln(2.5) = .15t(1)$

Answer: 6.11 $\frac{25000}{10000} = \frac{10000e^{.15t}}{10000}$ $\frac{\ln(2.5)}{.15} = \frac{.15t}{.15}$

$2.5 = e^{.15t}$ $6.108604773 = t$ OR $6.11 = t$ Round

ID: 4.7.41

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

$$\begin{cases} 4x - 2y = 10 \\ 5x + y = 23 \end{cases}$$

Handwritten: mult $\frac{4x-2y=10}{10x+2y=46}$ $14x+0=56$ $14x=56$ $\frac{14x}{14}=\frac{56}{14}$ $x=4$

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 $\{(x,y)|x=$ ☐ $, y$ 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 = **4** and y = **3**
(Type an integers or simplified fractions.)

Handwritten: Subst $4x-2y=10$ $4(4)-2y=10$ $16-2y=10$ $16-2y-16=10-16$ $-2y=-6$ $\frac{-2y}{-2}=\frac{-6}{-2}$ $y=3$

$(x,y)=(4,3)$

ID: 6.1.33

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

$$\begin{cases} x - 3y + 4z = 17 \\ 2x + y + z = 6 \\ -2x + 3y - 3z = -16 \end{cases}$$

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.

Use graphing calculator

Answer: A.

    The solution is x = [2] , y = [−1] , and z = [3] . (Type integers or simplified fractions.)

ID: 6.1.45

2ND, Matrix, edit, [A], 3×4, enter

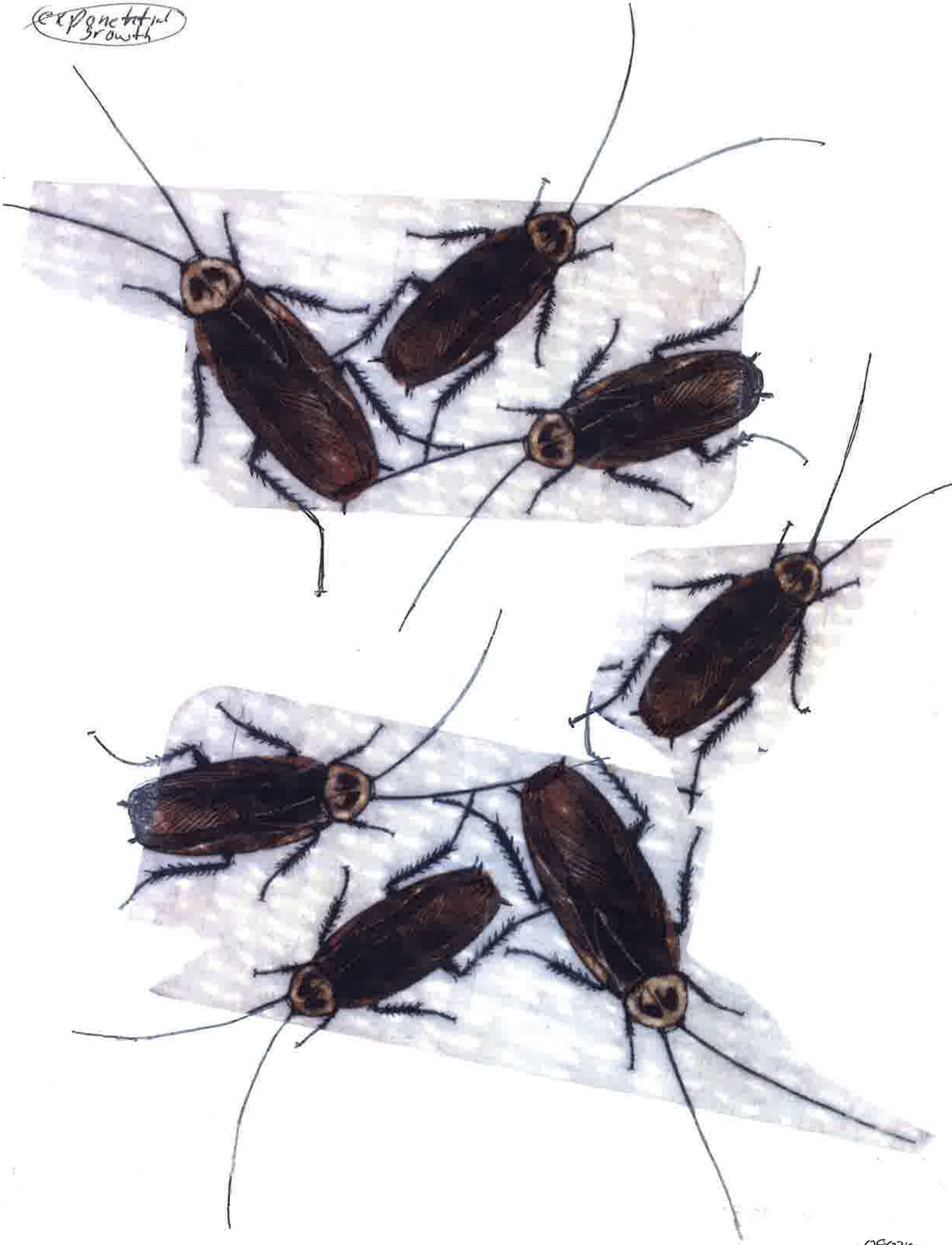$[A] = \begin{bmatrix} 1 & -3 & 4 & 17 \\ 2 & 1 & 1 & 6 \\ -2 & 3 & -3 & -16 \end{bmatrix}$

2nd, Matrix, Math, ↓, rref( ), enter

rref([A]) =

$\begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 3 \end{bmatrix}$

$(x, y, z) = (2, -1, 3)$

exponential growth