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1 2 3 4 5 6 7 15 14 13 12 11

Contents

Name: ___________________________ Date: _____________

1. Use function notation to write g in terms of $f(x) = x^3$.

$$g(x) = -\frac{1}{5}(x+4)^3$$

A) $g(x) = -\frac{1}{5}\left[f(x)\right]^3 + 4$

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

C) $g(x) = -\left[f(x)\right]^3 + \frac{64}{5}$

D) $g(x) = -\frac{1}{5}\left[f(x)\right]^3 + 64$

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

2. Hooke's Law states that the force F required to compress or stretch a spring (within its elastic limits) is proportional to the distance d that the spring is compressed or stretched from its original length. That is, $F = kd$, where k is the measure of the stiffness of the spring and is called the *spring constant*. The table below shows the elongation d in centimeters of a spring when a force of F kilograms is applied.

Force, *F*	**Elongation, *d***
20	3.5
40	6.3
60	10.0
80	13.3
100	16.5

Find the equation of the line that seems to best fit the data.

A) $F = 12.098d$
B) $F = 3.024d$
C) $F = 6.049d$
D) $F = 4.537d$
E) $F = 7.561d$

3. Find $(fg)(x)$.

$f(x)=\sqrt{-5x}$ $\qquad g(x)=\sqrt{-8x+6}$

A) $(fg)(x)=2x\sqrt{10}-\sqrt{30x}$
B) $(fg)(x)=2x\sqrt{10-30x}$
C) $(fg)(x)=\sqrt{-13x+6}$
D) $(fg)(x)=\sqrt{40x^2+6}$
E) $(fg)(x)=\sqrt{40x^2-30x}$

4. If f is an even function, determine if g is even, odd, or neither.

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

A) even
B) odd
C) cannot be determined
D) neither

5. Given the following function, $h(x)$, find two functions f and g such that $(f\circ g)(x)=h(x)$.

$h(x)=\sqrt[3]{x^2-11}$

A) $f(x)=\sqrt[3]{x^2}$, $g(x)=-11$
B) $f(x)=\sqrt[3]{x^2}$, $g(x)=x-11$
C) $f(x)=\sqrt[3]{x}$, $g(x)=x-11$
D) $f(x)=\sqrt[3]{x-11}$, $g(x)=x^2$
E) $f(x)=\sqrt[3]{x-11}$, $g(x)=x+11$

6. Evaluate the following function at the specified value of the independent variable and simplify.

$f(w)=\dfrac{-7w^2+20}{w^2}$; $\qquad f(0)$

A) 20
B) 0
C) –7
D) 13
E) undefined

7. Determine algebraically whether the following function is one-to-one.

$|x-5|, \quad x \le 5$

A)

$$\left.\begin{aligned} |a-5| &= |b-5| \\ 5-a &= 5-b \\ -a &= -b \\ a &= b \end{aligned}\right. \text{; one-to-one}$$

B)

$$\left.\begin{aligned} |a-5| &= |b-5| \\ |a|-5 &= |b|-5 \\ |a| &= |b| \\ a &= b \end{aligned}\right. \text{; one-to-one}$$

C)

$$\left.\begin{aligned} |a-5| &= |b-5| \\ a+5 &= 5-b \\ a &= -b \end{aligned}\right. \text{; not one-to-one}$$

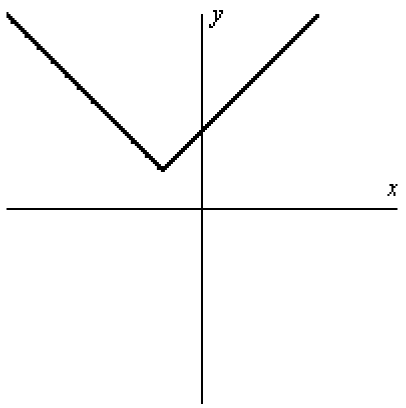
D)

$$\begin{aligned} |a-5| &= |b-5| \\ |-5|-a &= |-5|+b\text{; not one-to-one} \\ -a &= b \end{aligned}$$

E)

$$\left.\begin{aligned} |a-5| &= |b-5| \\ |-5|-a &= |-5|-b \\ -a &= -b \\ a &= b \end{aligned}\right. \text{; one-to-one}$$

8. Determine an equation that may represented by the graph shown below.



A) $f(x) = |x+1| - 1$
B) $f(x) = |x-1| + 1$
C) $f(x) = |x+1| + 1$
D) $f(x) = |x-1| - 1$
E) $f(x) = -|x-1| + 1$

9. Determine the domain and range of the inverse function f^{-1} of the following function f.

$f(x) = -|x+6| + 2$, where $x > -6$

A) Domain: $[-6, \infty)$; Range: $[2, \infty)$
B) Domain: $(-\infty, 2]$; Range: $[-6, \infty)$
C) Domain: $[-6, 2]$; Range: $[-6, \infty)$
D) Domain: $(-\infty, -6]$; Range: $[-2, \infty)$
E) Domain: $(-\infty, \infty)$; Range: $(-\infty, \infty)$

10. Find the domain of the function.

$f(y)=\sqrt{9-y^2}$

A) $-3 \le y \le 3$
B) $y \le -3$ or $y \ge 3$
C) $y \ge 0$
D) $y \le 3$
E) all real numbers

11. Find the slope-intercept form of the line passing through the points.

(–1, –6), (0, –2)

A) $y = 4x + 23$
B) $y = 4x - 2$
C) $y=\frac{1}{4}x-\frac{23}{4}$
D) $y=-\frac{1}{4}x+\frac{1}{2}$
E) $y = -4x - 10$

12. Write the slope-intercept form of the equation of the line through the given point perpendicular to the given line.

point: (–4, 7)   line: $-5x - 15y = -6$

A) $y=\frac{1}{5}x+\frac{39}{5}$
B) $y=-\frac{1}{3}x+\frac{17}{3}$
C) $y = 3x + 19$
D) $y = -5x + 27$
E) $y=3x-\frac{5}{3}$

13. Compare the graph of the following function with the graph of $f(x) = |x|$.

$$y = \left|\frac{4}{9}x\right|$$

A) vertical shift of $\frac{4}{9}$ units up

B) horizontal stretch of $\frac{9}{4}$ units

C) vertical shrink of $\frac{4}{9}$ units

D) horizontal shrink of $\frac{4}{9}$ units

vertical shift of $\frac{9}{4}$ units

E) horizontal shrink of $\frac{4}{9}$ units

14. Which equation does not represent y as a function of x?

A) $x = 2y + 5$
B) $x = 6$
C) $y = -5x - 7$
D) $y = |6 + 9x^2|$
E) $y = \sqrt{-8 + 4x}$

15. Evaluate the function at the specified value of the independent variable and simplify.

$$q(p) = \frac{-2p}{5p-2}$$

$q\,(x-9)$

A) $\dfrac{-2x+18}{5x-47}$

B) $\dfrac{-2x-18}{5x-47}$

C) $\dfrac{-2p+18}{5p-47}$

D) $\dfrac{18}{43}$

E) $-\dfrac{18}{47}$

16. Determine the domain of $g(x) = \dfrac{1}{x^2-49}$.

A) $[-7,7]$

B) $(-7,0]\cup[0,7)$

C) $(-\infty,-7)\cup(-7,7)\cup(7,\infty)$

D) $(-\infty,-7]\cup[7,\infty)$

E) $(-\infty,\infty)$

17. Find the difference quotient and simplify your answer.

$f(w) = -9w^2 + 2w,\qquad \dfrac{f(4+h)-f(4)}{h},\ h \neq 0$

A) $10 + h$

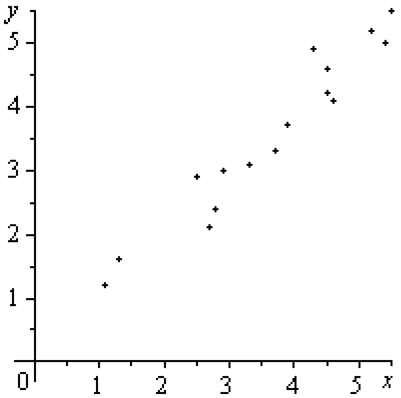
B) $-70-9w+\dfrac{16}{w}$

C) $2-9w+\dfrac{16}{w}$

D) $2-9h$

E) $-70-9h$

18. The scatter plots of different data are shown below. Determine whether there is a positive correlation, negative correlation, or no discernible correlation between the variables.



A) positive correlation
B) negative correlation
C) no discernible correlation

19. Evaluate the following function for $f(x) = -2x^2 + 1$ and $g(x) = x + 4$ algebraically.

$$\left(\frac{f}{g}\right)(q-4)$$

A) $\dfrac{-2q^2 + 5}{q+8}$

B) $\dfrac{-2q^2 + 8q - 31}{q}$

C) $\dfrac{-2q^2 + 5}{q}$

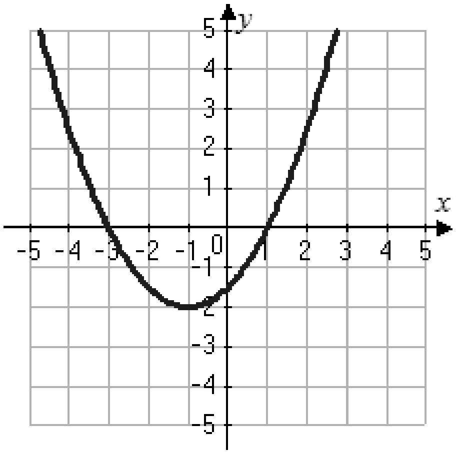
D) $\dfrac{-2q^2 + 16q - 31}{q}$

E) $\dfrac{-2q^2 - 3}{q}$

20. Use the graph of

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

to write an equation for the function whose graph is shown.



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

B)
$$f(x) = (x-1)^2 - 2$$

C)
$$f(x) = (x+1)^2 + 2$$

D)
$$f(x) = \frac{1}{2}(x-1)^2 - 2$$

E)
$$f(x) = \frac{1}{2}(x+1)^2 - 2$$

Answer Key

1. E
2. C
3. E
4. C
5. D
6. E
7. A
8. C
9. B
10. A
11. B
12. C
13. B
14. B
15. A
16. C
17. E
18. A
19. D
20. E

Name: ___________________________ Date: _____________

1. Evaluate the indicated function for $f(x) = x^2 - 5$ and $g(x) = x + 9$.

   $(fg)(-1)$
   A) -32
   B) -48
   C) -46
   D) 40
   E) -50

2. Find the value(s) of x for which $f(x) = g(x)$.

   $f(x) = x^2 - 7x + 3$ $\qquad g(x) = -3x + 8$
   A) $3, 10, \dfrac{8}{3}$
   B) $3, -7, \dfrac{8}{3}$
   C) $5, -1$
   D) $-5, 1$
   E) $4, \dfrac{8}{3}$

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

   $f(x) = -\dfrac{8x}{4x+7}$ $\qquad g(x) = -\dfrac{4}{x}$
   A) $(f-g)(x) = \dfrac{-8x+4}{3x+7}$
   B) $(f-g)(x) = \dfrac{-8x+23}{4x+7}$
   C) $(f-g)(x) = \dfrac{-8x+9}{4x+7}$
   D) $(f-g)(x) = \dfrac{-8x^2+16x-28}{4x^2+7x}$
   E) $(f-g)(x) = \dfrac{-8x^2+16x+28}{4x^2+7x}$

4. If f is an even function, determine if g is even, odd, or neither.
   $g(x) = f(-x) + 1$
   A) even
   B) odd
   C) cannot be determined
   D) neither

5. Evaluate the function at the specified value of the independent variable and simplify.

   $f(p) = \dfrac{-3p}{4p-3}$

   $f(s+8)$
   A) $\dfrac{-3s-24}{4s+29}$
   B) $\dfrac{-3s+24}{4s+29}$
   C) $\dfrac{-3p-24}{4p+29}$
   D) $\dfrac{24}{35}$
   E) $-\dfrac{24}{29}$

6. Determine the domain of $g(x) = \dfrac{1}{x^2-81}$.
   A) $[-9,9]$
   B) $(-9,0]\cup[0,9)$
   C) $(-\infty,-9)\cup(-9,9)\cup(9,\infty)$
   D) $(-\infty,-9]\cup[9,\infty)$
   E) $(-\infty,\infty)$

7. Determine whether lines L_1 and L_2 passing through the pairs of points are parallel, perpendicular, or neither.

L_1 : (7, –4), (–9, –1)
L_2 : (4, –6), (–3, 9)
A) parallel
B) perpendicular
C) neither

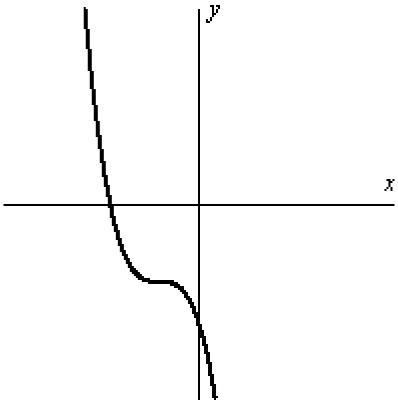
8. Algebraically determine whether the function below is even, odd, or neither.
$f(q) = 2q^{3/2}$
A) even
B) odd
C) cannot be determined
D) neither

9. Find $f \circ g$.

$f(x) = x + 2$ $\qquad$ $g(x) = \dfrac{5}{x^2 - 4}$

A) $(f \circ g)(x) = \dfrac{5}{x^2}$
B) $(f \circ g)(x) = \dfrac{5}{x^2 + 4x}$
C) $(f \circ g)(x) = \dfrac{2x^2 + 3}{x^2 - 4}$
D) $(f \circ g)(x) = \dfrac{7}{x^2 - 4}$
E) $(f \circ g)(x) = \dfrac{2x^2 - 3}{x^2 - 4}$

10. Determine an equation that may represented by the graph shown below.



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

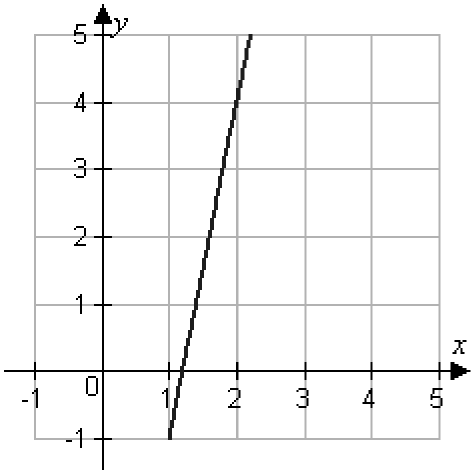
B) $f(x) = -(x-1)^3 + 2$

C) $f(x) = -(x-1)^3 - 2$

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

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

11. Estimate the slope of the line.



A) -5

B) 0

C) 5

D) $\frac{1}{5}$

E) $\frac{2}{5}$

12. Compare the graph of the following function with the graph of $f(x)=|x|$.

$$y=\left|\frac{1}{9}x\right|$$

A) vertical shift of $\frac{1}{9}$ unit up

B) horizontal stretch of $\frac{9}{1}$ unit

C) vertical shrink of $\frac{1}{9}$ unit

D) horizontal shrink of $\frac{1}{9}$ unit

vertical shift of $\frac{9}{1}$ unit

E) horizontal shrink of $\frac{1}{9}$ unit

13. Use a graphing utility to graph the function and visually determine the intervals over which the function is increasing, decreasing, or constant.

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

A)

decreasing on $(0, 0)$

increasing on $(0, \infty)$

B)

increasing on $(-\infty, -1)$

decreasing on $(-1, 0)$

increasing on $(0, 1)$

decreasing on $(1, \infty)$

C)

decreasing on $(-\infty, -1)$

increasing on $(-1, 1)$

decreasing on $(1, \infty)$

D)

increasing on $(-\infty, 0)$

decreasing on $(0, \infty)$

E)

decreasing on $(-\infty, -1)$

increasing on $(-1, 0)$

decreasing on $(0, 1)$

increasing on $(1, \infty)$

14. Hooke's Law states that the force F required to compress or stretch a spring (within its elastic limits) is proportional to the distance d that the spring is compressed or stretched from its original length. That is, $F = kd$, where k is the measure of the stiffness of the spring and is called the *spring constant*. The table below shows the elongation d in centimeters of a spring when a force of F kilograms is applied.

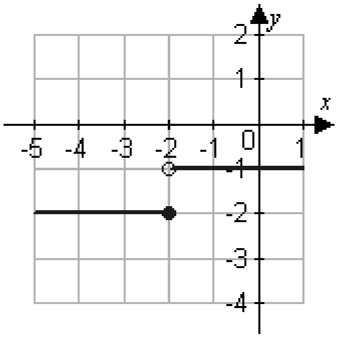
Force, *F*	**Elongation, *d***
20	2.8
40	5.0
60	8.0
80	10.6
100	13.2

Find the equation of the line that seems to best fit the data. Use the model to estimate the elongation of the spring when a force of 50 kilograms is applied. Round your answer to one decimal place.
A) 13.2 centimeters
B) 9.9 centimeters
C) 3.3 centimeters
D) 6.6 centimeters
E) 5.0 centimeters

15. Find $f \circ g$.

$f(x) = 3x - 2$ $\qquad$ $g(x) = x - 5$
A) $(f \circ g)(x) = 3x - 17$
B) $(f \circ g)(x) = 3x - 7$
C) $(f \circ g)(x) = 3x^2 - 17x + 10$
D) $(f \circ g)(x) = 2x + 3$
E) $(f \circ g)(x) = 2x - 7$

16. Use the graph of the function to find the domain and range of *f*.



A)
domain : $(-\infty,-2)\cup(-2,\infty)$
range : $(-\infty,-2)\cup(-1,\infty)$

B)
domain : $(-\infty,-2)\cup(-2,\infty)$
range : $\{-2,-1\}$

C)
domain : all real numbers
range : $\{-2,-1\}$

D)
domain : $(-\infty,-2)\cup(-2,\infty)$
range : $(-1,1)$

E)
domain : $\{-2,-1\}$
range : all real numbers

17. Find the inverse function of *f*.

$f(x)=x^5+5$

A) $f^{-1}(x)=-\sqrt[5]{x}+5$

B) $f^{-1}(x)=\sqrt[5]{x}+5$

C) $f^{-1}(x)=-\sqrt[5]{x+5}$

D) $f^{-1}(x)=\sqrt[5]{x-5}$

E) $f^{-1}(x)=\sqrt[5]{x}-5$

18. Evaluate the following function at the specified value of the independent variable and simplify.

$$f(u) = \frac{4u^2 + 12}{u^2}; \qquad f(0)$$

A) 12
B) 0
C) 4
D) 16
E) undefined

19. Find $g \circ f$.

$f(x) = x + 2 \qquad g(x) = x^2$

A) $(g \circ f)(x) = x^2 + 2$
B) $(g \circ f)(x) = x^2 - 4$
C) $(g \circ f)(x) = x^2 + 4$
D) $(g \circ f)(x) = x^2 + 2x + 4$
E) $(g \circ f)(x) = x^2 + 4x + 4$

20. Find all real values of x such that $f(x) = 0$.

$$f(x) = \frac{-3x - 2}{5}$$

A) $-\frac{2}{15}$
B) $\pm\frac{2}{15}$
C) $\pm\frac{2}{3}$
D) $-\frac{2}{3}$
E) $\frac{2}{3}$

Answer Key

1. A
2. C
3. E
4. A
5. A
6. C
7. C
8. D
9. E
10. D
11. C
12. B
13. E
14. D
15. A
16. C
17. D
18. E
19. E
20. D

Name: ___________________________ Date: _____________

1. Find the difference quotient and simplify your answer.

   $f(s) = -2s^2 - 2s,$ $\qquad \dfrac{f(4+h) - f(4)}{h}, \; h \neq 0$

   A) $6 + h$
   B) $-18 - 2s - \dfrac{16}{s}$
   C) $-2 - 2s - \dfrac{16}{s}$
   D) $-2 - 2h$
   E) $-18 - 2h$

2. Determine whether the function has an inverse function. If it does, find the inverse function.

   $f(x) = x^2 + 5$
   A) No inverse function exists.
   B) $f^{-1}(x) = \sqrt{x} + 5, \; x \geq 0$
   C) $f^{-1}(x) = \sqrt{x} - 5$
   D) $f^{-1}(x) = \sqrt{x+5}, \; x \geq -6$
   E) $f^{-1}(x) = \sqrt{x-5}$

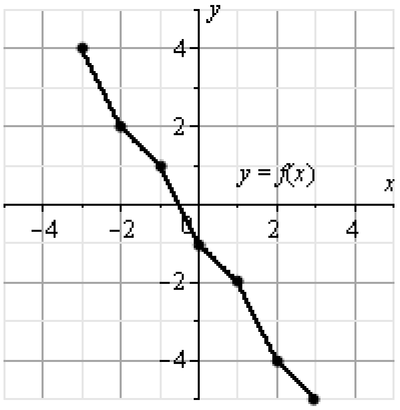
3. Which equation does not represent y as a function of x?
   A) $x = -9y + 2$
   B) $x = -1$
   C) $y = 7x - 9$
   D) $y = |6 - x^2|$
   E) $y = \sqrt{-9 + 6x}$

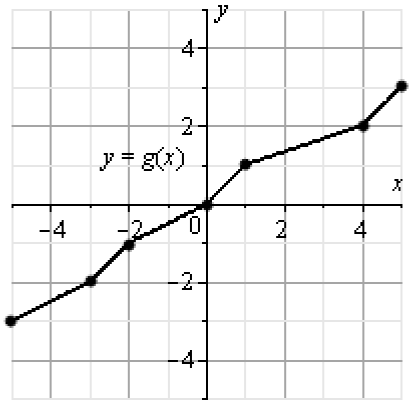
4. Determine the domain and range of the inverse function f^{-1} of the following function f .

$f(x) = -|x+7| - 1$, where $x > -7$

A) Domain: $[-7, \infty)$; Range: $[-1, \infty)$
B) Domain: $(-\infty, -1]$; Range: $[-7, \infty)$
C) Domain: $[-7, -1]$; Range: $[-7, \infty)$
D) Domain: $(-\infty, -7]$; Range: $[1, \infty)$
E) Domain: $(-\infty, \infty)$; Range: $(-\infty, \infty)$

5. Use the graphs of $y = f(x)$ and $y = g(x)$ to evaluate $(g^{-1} \circ f^{-1})(-4)$.





A) 4
B) 1.3
C) 0
D) –2
E) –2.5

6. Compare the graph of the following function with the graph of $f(x) = x^3$.

$y = \left[5(x+10)\right]^3$

A) vertical shift of 10 units up

B) vertical shift of 10 units up
horizontal shrink of $\frac{1}{5}$ units

C) horizontal shift of 10 units to the left
horizontal shrink of $\frac{1}{125}$ units

D) horizontal shift of 10 units to the left
horizontal stretch of $\frac{1}{5}$ units

E) horizontal shift of 10 units to the left
vertical shift of 5 units up

7. Find $f \circ g$.

$f(x) = \left|x^2 - 6\right|$ $\qquad g(x) = -9 - x$

A) $(f \circ g)(x) = \left|x^2 + 18x + 75\right|$

B) $(f \circ g)(x) = \left|x^2 + 75\right|$

C) $(f \circ g)(x) = \left|-3 - x^2\right|$

D) $(f \circ g)(x) = \left|-15 - x^2\right|$

E) $(f \circ g)(x) = -9 - \left|x^2 - 6\right|$

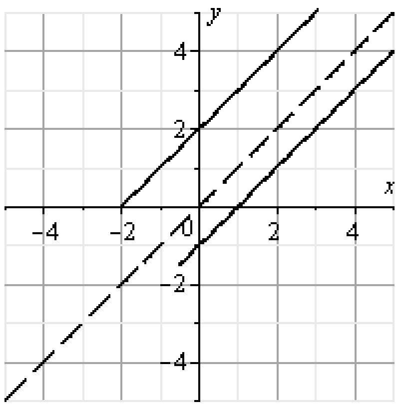
8. The average lengths L of cellular phone calls in minutes from 1999 to 2004 are shown in the table below.

Year	Average length, L (in minutes)
1999	2.38
2000	2.56
2001	2.74
2002	2.73
2003	2.87
2004	3.05

Use the *regression* feature of a graphing utility to find a linear model for the data. Let t represent the year, with $t = 9$ corresponding to 1999. Use the model to predict the average lengths of cellular phone calls for the year 2015. Round your answer to two decimal places.

A) 4.37 minutes
B) 8.74 minutes
C) 5.37 minutes
D) 3.37 minutes
E) 2.19 minutes

9. Decide whether the two functions shown in the graph below appear to be inverse functions of each other.



A) yes
B) no
C) not enough information

10. Use a graphing utility to graph the function and visually determine the intervals over which the function is increasing, decreasing, or constant.

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

A)
increasing on $(-\infty, -1)$
decreasing on $(-1, 1)$
increasing on $(1, \infty)$

B)
decreasing on $(-\infty, 0)$
increasing on $(0, \infty)$

C)
decreasing on $(-\infty, \infty)$

D)
increasing on $(-\infty, \infty)$

E)
decreasing on $(-\infty, -1)$
increasing on $(-1, 1)$
decreasing on $(1, \infty)$

11. Find the value(s) of x for which $f(x) = g(x)$.

$f(x) = x^2 - 13x + 5$ $\qquad$ $g(x) = -9x + 2$

A) $5, 18, \frac{2}{9}$
B) $5, -13, \frac{2}{9}$
C) 3, 1
D) –3, –1
E) $8, \frac{2}{9}$

12. Use function notation to write g in terms of $f(x) = x^3$.

$$g(x) = -\frac{1}{4}(x+9)^3$$

A) $g(x) = -\frac{1}{4}[f(x)]^3 + 9$

B) $g(x) = -\frac{1}{4}[f(x)+9]$

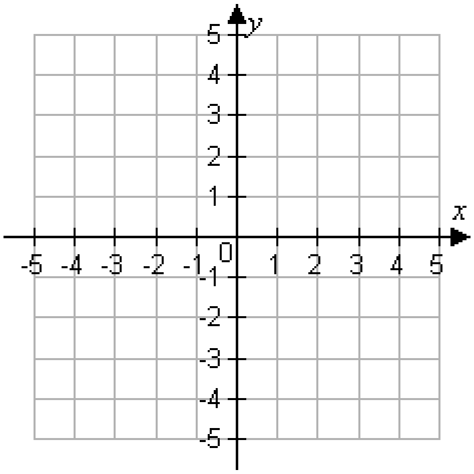
C) $g(x) = -[f(x)]^3 + \frac{729}{4}$

D) $g(x) = -\frac{1}{4}[f(x)]^3 + 729$

E) $g(x) = -\frac{1}{4}[f(x+9)]$

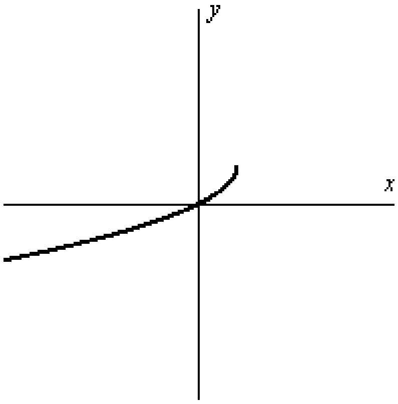
13. Plot the points and find the slope of the line passing through the pair of points.

(3, 4), (–2, 4)



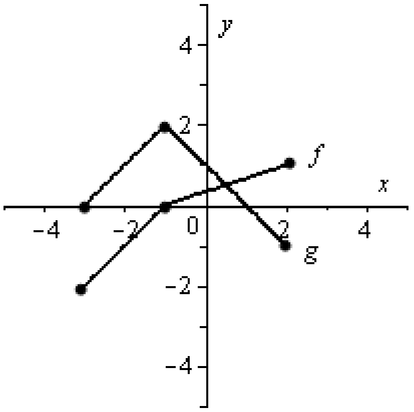
A) slope: 0
B) slope: 1
C) slope: –5
D) slope: $-\frac{1}{5}$
E) slope: undefined

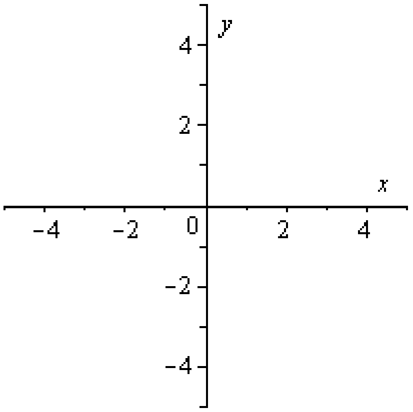
14. Determine an equation that may represented by the graph shown below.



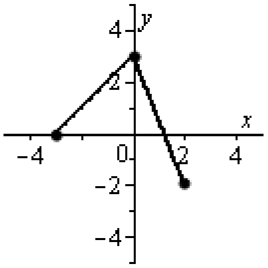
A) $f(x) = 1 - \sqrt{1 - x}$
B) $f(x) = -1 - \sqrt{1 - x}$
C) $f(x) = -1 + \sqrt{1 - x}$
D) $f(x) = -1 - \sqrt{1 + x}$
E) $f(x) = -1 + \sqrt{1 + x}$

15. Use the graphs of f and g, shown below, to graph $h(x) = (f+g)(x)$.

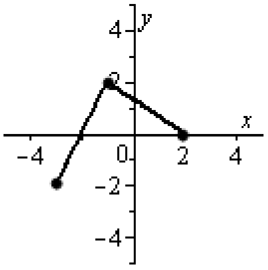




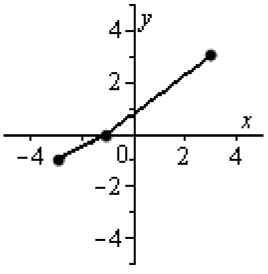
A)

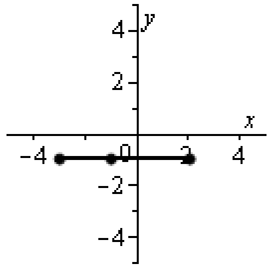


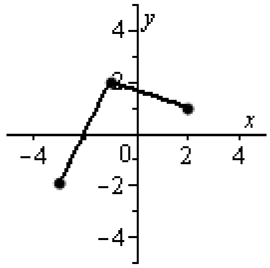
B)



C)



D) 

E) 

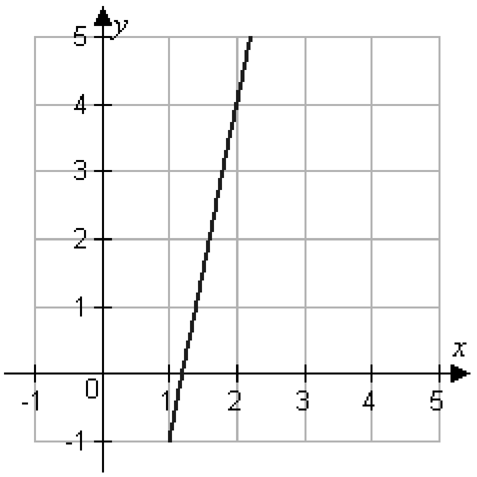
16. Evaluate the function at the specified value of the independent variable and simplify.

$f(y) = 2y + 7$

$f(-1.4)$

A) $-2.8y + 14$
B) -9.8
C) 4.2
D) $-1.4y + 7$
E) $-1.4y - 7$

17. Estimate the slope of the line.



A) -5

B) 0

C) 5

D) $\frac{1}{5}$

E) $\frac{2}{5}$

18. Use the functions $f(x) = \frac{1}{125}x - 5$ and $g(x) = x^3$ to find $(f \circ g)^{-1}$.

A) $(f \circ g)^{-1} = \frac{x^3 + 5}{5}$

B) $(f \circ g)^{-1} = \frac{x^3 - 625}{125}$

C) $(f \circ g)^{-1} = \frac{\sqrt[3]{x+5}}{5}$

D) $(f \circ g)^{-1} = 5x + 5$

E) $(f \circ g)^{-1} = 5\sqrt[3]{x+5}$

19. Find all real values of x such that $f(x) = 0$.

$$f(x) = \frac{7x - 5}{7}$$

A) $\frac{5}{49}$

B) $\pm\frac{5}{49}$

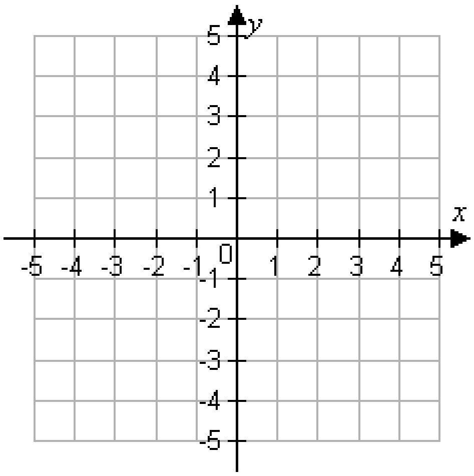
C) $\pm\frac{5}{7}$

D) $\frac{5}{7}$

E) $-\frac{5}{7}$

20. Graph the function and determine the interval(s) for which $f(x) \geq 0$.

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



A) $(-\infty, 0] \cup [4, \infty)$

B) $[0, 4]$

C) $(0, 4)$

D) $(-\infty, 0) \cup (4, \infty)$

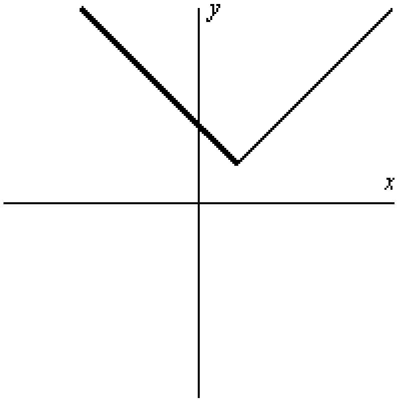
E) $\{4\}$

Answer Key

1. E
2. A
3. B
4. B
5. A
6. C
7. A
8. A
9. B
10. E
11. C
12. E
13. A
14. A
15. B
16. C
17. C
18. E
19. D
20. B

Name: ___________________________ Date: _____________

1. Determine an equation that may represented by the graph shown below.



A) $f(x) = |x-1| - 1$
B) $f(x) = -|x-1| + 1$
C) $f(x) = |x-1| + 1$
D) $f(x) = |x+1| + 1$
E) $f(x) = |x+1| - 1$

2. Find the inverse function of *f*.

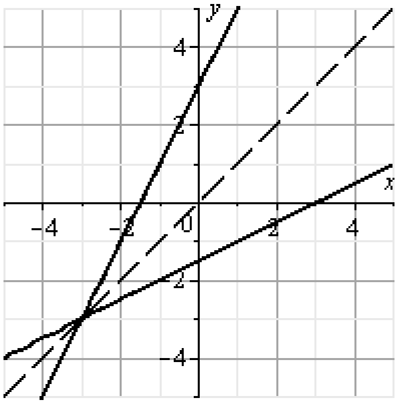
$f(x) = x^5 - 1$
A) $f^{-1}(x) = -\sqrt[5]{x} - 1$
B) $f^{-1}(x) = \sqrt[5]{x} - 1$
C) $f^{-1}(x) = -\sqrt[5]{x-1}$
D) $f^{-1}(x) = \sqrt[5]{x+1}$
E) $f^{-1}(x) = \sqrt[5]{x} + 1$

3. Find the domain of the function.

$$g(w) = \frac{4w}{w+9}$$

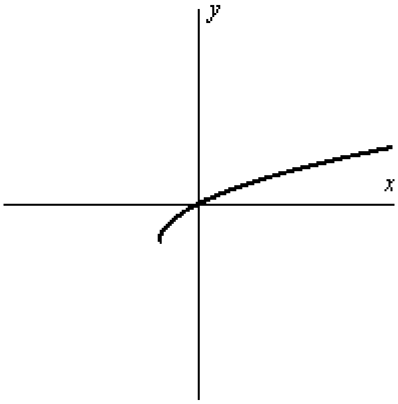
A) all real numbers $w \neq -9$
B) all real numbers $w \neq -9$, $w \neq 0$
C) all real numbers
D) $w = -9$, $w = 0$
E) $w = -9$

4. Decide whether the two functions shown in the graph below appear to be inverse functions of each other.



A) no
B) yes
C) not enough information

5. Determine an equation that may represented by the graph shown below.



A) $f(x) = -1 + \sqrt{1+x}$
B) $f(x) = 1 - \sqrt{1-x}$
C) $f(x) = -1 - \sqrt{1-x}$
D) $f(x) = -1 + \sqrt{1-x}$
E) $f(x) = -1 - \sqrt{1+x}$

6. Which equation does not represent y as a function of x?
A) $x = 6y - 9$
B) $x = -5$
C) $y = x + 5$
D) $y = |-1 - x^2|$
E) $y = \sqrt{-5 + 4x}$

7. Determine algebraically whether the following function is one-to-one.

$f(x) = \dfrac{5x^2}{3x^2+6}$, where $x > 0$

A)

$$\begin{aligned}
\frac{5a^2}{3a^2+6} &= \frac{5b^2}{3b^2+6} \\
\frac{5a^2}{3a^2}+\frac{5a^2}{6} &= \frac{5b^2}{3b^2}+\frac{5b^2}{6} \\
\frac{5}{3}+\frac{5a^2}{6} &= \frac{5}{3}+\frac{5b^2}{6} \\
\frac{30+5a^2}{18} &= \frac{30+5b^2}{18} \\
30+5a^2 &= 30+5b^2 \\
5a^2 &= 5b^2 \\
a^2 &= b^2 \\
\pm a &= \pm b
\end{aligned}$$

; not one-to-one

B)

$$\begin{aligned}
\frac{5a^2}{3a^2+6} &= \frac{5b^2}{3b^2+6} \\
\frac{5}{3+6} &= \frac{5}{3+6} \\
\frac{5}{6} &= \frac{3}{6} \\
a &= b
\end{aligned}$$

; one-to-one

C)

$$\begin{aligned}
\frac{5a^2}{3a^2+6} &= \frac{5b^2}{3b^2+6} \\
\frac{5a^2}{3a^2} &= \frac{5b^2}{3b^2} \\
\frac{5}{3} &= \frac{5}{3} \\
a &= b
\end{aligned}$$

; one-to-one

D)

$$\begin{aligned} \frac{5a^2}{3a^2+6} &= \frac{5b^2}{3b^2+6} \\ \frac{5a^2}{9a^2} &= \frac{5b^2}{9b^2} \\ \frac{5a}{9} &= \frac{5b}{9} \\ 5a &= 5b \\ a &= b \end{aligned} \text{ ; one-to-one}$$

E)

$$\begin{aligned} \frac{5a^2}{3a^2+6} &= \frac{5b^2}{3b^2+6} \\ \frac{5a^2}{3a^2}+\frac{5a^2}{6} &= \frac{5b^2}{3b^2}+\frac{5b^2}{6} \\ \frac{5}{3}+\frac{5a^2}{6} &= \frac{5}{3}+\frac{5b^2}{6} \\ \frac{30+5a^2}{18} &= \frac{30+5b^2}{18} \\ 30+5a^2 &= 30+5b^2 \\ 5a^2 &= 5b^2 \\ a^2 &= b^2 \\ a &= b \end{aligned} \text{ ; one-to-one}$$

8. Find $f \circ g$.

$f(x) = x + 3 \qquad g(x) = \dfrac{4}{x^2 - 9}$

A) $(f \circ g)(x) = \dfrac{4}{x^2}$

B) $(f \circ g)(x) = \dfrac{4}{x^2 + 6x}$

C) $(f \circ g)(x) = \dfrac{3x^2 + 1}{x^2 - 9}$

D) $(f \circ g)(x) = \dfrac{7}{x^2 - 9}$

E) $(f \circ g)(x) = \dfrac{3x^2 - 23}{x^2 - 9}$

9. Use function notation to write g in terms of $f(x) = \sqrt{x}$.

$g(x) = -\dfrac{1}{3}\sqrt{x-8} + 7$

A) $g(x) = -f(x-8) + 6$

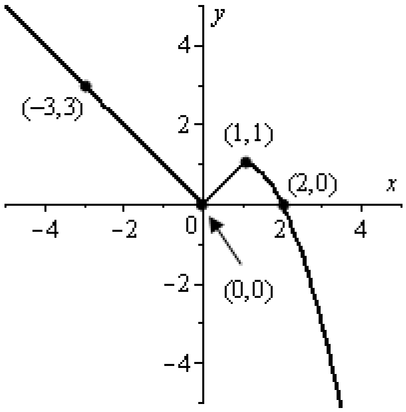
B) $g(x) = -\dfrac{1}{3} f(x) - 1$

C) $g(x) = -\dfrac{1}{3} f(x-8) + 7$

D) $g(x) = f(x) + 7$

E) $g(x) = f(x-8) - \dfrac{7}{3}$

10. Determine a piecewise-defined function for the graph shown below.



A)

$$f(x) = \begin{cases} |x|, & x \le 1 \\ -(x-1)^2 + 1, & x > 1 \end{cases}$$

B)

$$f(x) = \begin{cases} |x|, & x \le 0 \\ -(x-1)^2 + 1, & x \le 0 \end{cases}$$

C)

$$f(x) = \begin{cases} |x|, & x \ge 1 \\ -x^2, & x \le 1 \end{cases}$$

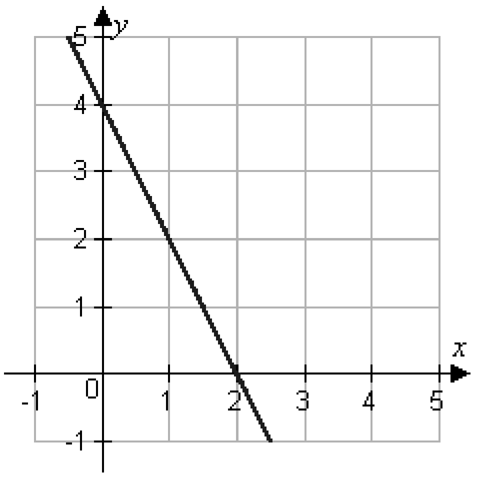
D)

$$f(x) = \begin{cases} |x|, & x \ge 0 \\ -x^2, & x \le 1 \end{cases}$$

E)

$$f(x) = \begin{cases} |x|, & x \le 1 \\ -(x-1)^2, & x > 1 \end{cases}$$

11. Estimate the slope of the line.



A) $-\frac{1}{2}$

B) 2

C) -2

D) $\frac{1}{2}$

E) -3

12. Determine whether the function is even, odd, or neither.

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

A) neither
B) even
C) odd

13. Find the slope and y-intercept of the equation of the line.

$y = -2x + 3$

A) slope: $-\frac{1}{2}$; y-intercept: 3
B) slope: $\frac{1}{3}$; y-intercept: –2
C) slope: –2; y-intercept: 3
D) slope: 3; y-intercept: –2
E) slope: –2; y-intercept: –3

14. Determine whether lines L_1 and L_2 passing through the pairs of points are parallel, perpendicular, or neither.

L_1 : (–1, 1), (–1, –6)
L_2 : (3, –8), (24, –8)
A) parallel
B) perpendicular
C) neither

15. Show algebraically that the functions f and g shown below are inverse functions.

$$f(x)=\sqrt[3]{8x-7},\quad g(x)=\frac{x^3+7}{8}$$

A)

$$\begin{aligned} f(g(x)) &= \sqrt[3]{8\left(\frac{x^3+7}{8}\right)-7} \\ &= \sqrt[3]{\left(x^3+56\right)-56} \\ &= \sqrt[3]{x^3+56-56} \\ &= \sqrt[3]{x^3} \\ &= x \end{aligned} \qquad \begin{aligned} g(f(x)) &= \frac{\left(\sqrt[3]{8x-7}\right)^3+7}{8} \\ &= \frac{8x-7^3+7^3}{8} \\ &= \frac{8x}{8} \\ &= x \end{aligned}$$

B)

$$\begin{aligned} f(g(x)) &= \sqrt[3]{8\left(\frac{x^3+7}{8}\right)-7} \\ &= \sqrt[3]{\left(x^3+7\right)-7} \\ &= \sqrt[3]{x^3+7-7} \\ &= \sqrt[3]{x^3} \\ &= x \end{aligned} \qquad \begin{aligned} g(f(x)) &= \frac{\left(\sqrt[3]{8x-7}\right)^3+7}{8} \\ &= \frac{8x-7+7}{8} \\ &= \frac{8x}{8} \\ &= x \end{aligned}$$

C)

$$\begin{aligned} f(g(x)) &= \sqrt[3]{8\left(\frac{x^3+7}{8}\right)-7} \\ &= \sqrt[3]{\left(\frac{8x^3+7}{8}\right)-7} \\ &= \sqrt[3]{x^3+7-7} \\ &= \sqrt[3]{x^3} \\ &= x \end{aligned} \qquad \begin{aligned} g(f(x)) &= \frac{\left(\sqrt[3]{8x-7}\right)^3+7}{8} \\ &= \frac{8^3x-7+7}{8^3} \\ &= \frac{8^3x}{8^3} \\ &= x \end{aligned}$$

D)

$$\begin{aligned} f(g(x)) &= \sqrt[3]{8\left(\frac{x^3+7}{8}\right)-7} \\ &= \sqrt[3]{\left(8x^3+56\right)-56} \\ &= \sqrt[3]{8x^3+56-56} \\ &= \sqrt[3]{8x^3} \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= \frac{\left(\sqrt[3]{8x-7}\right)^3+7}{8} \\ &= \frac{8^3x-7^3+7^3}{8^3} \\ &= \frac{8^3x}{8^3} \\ &= x \end{aligned}$$

E)

$$\begin{aligned} f(g(x)) &= \sqrt[3]{8\left(\frac{x^3+7}{8}\right)-7} \\ &= \sqrt[3]{\left(x^3+\frac{7}{8}\right)-7} \\ &= \sqrt[3]{x^3+\frac{0}{8}} \\ &= \sqrt[3]{x^3} \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= \frac{\left(\sqrt[3]{8x-7}\right)^3+7}{8} \\ &= \frac{24x-21+21}{24} \\ &= \frac{24x}{24} \\ &= x \end{aligned}$$

16. Find all real values of x such that $f(x) = 0$.

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

A) $\frac{1}{2}$

B) $\pm\frac{1}{2}$

C) $\pm\frac{5}{2}$

D) $\frac{5}{2}$

E) $-\frac{5}{2}$

17. Compare the graph of the following function with the graph of $f(x)=|x|$.

$$y=\left|\frac{3}{4}x\right|$$

A) vertical shift of $\frac{3}{4}$ units up

B) horizontal stretch of $\frac{4}{3}$ units

C) vertical shrink of $\frac{3}{4}$ units

D) horizontal shrink of $\frac{3}{4}$ units

vertical shift of $\frac{4}{3}$ units

E) horizontal shrink of $\frac{3}{4}$ units

18. Find the domain of the function.

$$g(x)=\sqrt{25-x^2}$$

A) $-5 \le x \le 5$
B) $x \le -5$ or $x \ge 5$
C) $x \ge 0$
D) $x \le 5$
E) all real numbers

19. Use the functions $f(x)=x+4$ and $g(x)=5x-7$ to find $(g \circ f)^{-1}$.

A) $(g \circ f)^{-1}=\dfrac{5x+11}{4}$

B) $(g \circ f)^{-1}=5x-42$

C) $(g \circ f)^{-1}=\dfrac{x-13}{5}$

D) $(g \circ f)^{-1}=\dfrac{-7x-7}{5}$

E) $(g \circ f)^{-1}=5x+13$

20. Find the value(s) of x for which $f(x) = g(x)$.

$f(x) = x^2 - 11x - 36$ $\qquad$ $g(x) = -7x - 4$

A) $-36, -25, -\frac{4}{7}$

B) $-36, -11, -\frac{4}{7}$

C) $8, -4$

D) $-8, 4$

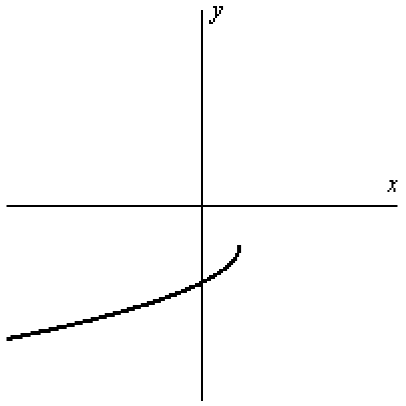
E) $47, -\frac{4}{7}$

Answer Key

1. C
2. D
3. A
4. B
5. A
6. B
7. E
8. E
9. C
10. A
11. C
12. C
13. C
14. B
15. B
16. D
17. B
18. A
19. C
20. C

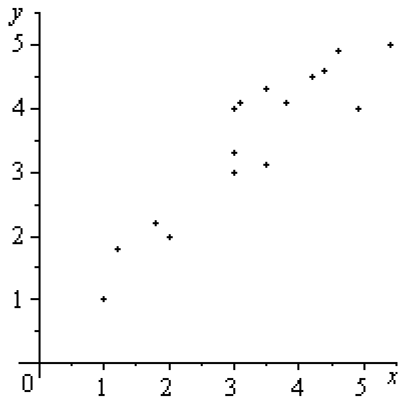
Name: ___________________________ Date: _____________

1. Determine an equation that may represented by the graph shown below.



A) $f(x) = -1 - \sqrt{1-x}$
B) $f(x) = -1 + \sqrt{1-x}$
C) $f(x) = -1 - \sqrt{1+x}$
D) $f(x) = -1 + \sqrt{1+x}$
E) $f(x) = 1 - \sqrt{1-x}$

2. The scatter plots of different data are shown below. Determine whether there is a positive correlation, negative correlation, or no discernible correlation between the variables.



A) positive correlation
B) negative correlation
C) no discernible correlation

3. Does the table describe a function?

Input value	–6	–3	0	3	6
Output value	11	11	11	11	11

A) yes
B) no

4. Find the domain of the function.

$$g(w) = \frac{-7w}{w-5}$$

A) all real numbers $w \neq 5$
B) all real numbers $w \neq 5$, $w \neq 0$
C) all real numbers
D) $w = 5, w = 0$
E) $w = 5$

5. Determine the domain and range of the inverse function f^{-1} of the following function f .

$f(x) = -|x+8| - 3$, where $x > -8$

A) Domain: $[-8,\infty)$; Range: $[-3,\infty)$
B) Domain: $(-\infty,-3]$; Range: $[-8,\infty)$
C) Domain: $[-8,-3]$; Range: $[-8,\infty)$
D) Domain: $(-\infty,-8]$; Range: $[3,\infty)$
E) Domain: $(-\infty,\infty)$; Range: $(-\infty,\infty)$

6. Use function notation to write g in terms of $f(x) = x^3$.

$$g(x) = -\frac{1}{2}(x+9)^3$$

A) $g(x) = -\frac{1}{2}[f(x)]^3 + 9$

B) $g(x) = -\frac{1}{2}[f(x)+9]$

C) $g(x) = -[f(x)]^3 + \frac{729}{2}$

D) $g(x) = -\frac{1}{2}[f(x)]^3 + 729$

E) $g(x) = -\frac{1}{2}[f(x+9)]$

7. Evaluate the indicated function for $f(x) = x^2 - 1$ and $g(x) = x - 6$.

$(fg)(-2)$

A) –24
B) 40
C) –2
D) 12
E) 24

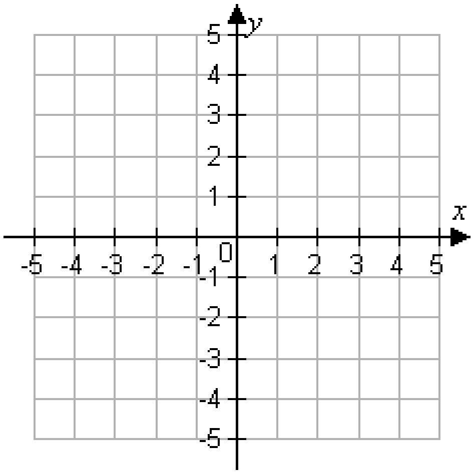
8. If f is an even function, determine if g is even, odd, or neither.

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

A) even
B) odd
C) cannot be determined
D) neither

9. Plot the points and find the slope of the line passing through the pair of points.

   (1, 0), (5, 3)



A) slope: $\frac{4}{3}$

B) slope: $-\frac{4}{3}$

C) slope: $\frac{1}{2}$

D) slope: $\frac{3}{4}$

E) slope: $-\frac{3}{4}$

10. Compare the graph of the following function with the graph of $f(x)=x^3$.

$y=\left[5(x-2)\right]^3$

A) vertical shift of 2 units down

B) vertical shift of 2 units down
horizontal shrink of $\frac{1}{5}$ units

C) horizontal shift of 2 units to the right
horizontal shrink of $\frac{1}{125}$ units

D) horizontal shift of 2 units to the right
horizontal stretch of $\frac{1}{5}$ units

E) horizontal shift of 2 units to the right
vertical shift of 5 units down

11. Find the slope-intercept form of the line passing through the points.

(–4, –2), (–1, 7)

A) $y=3x+2$

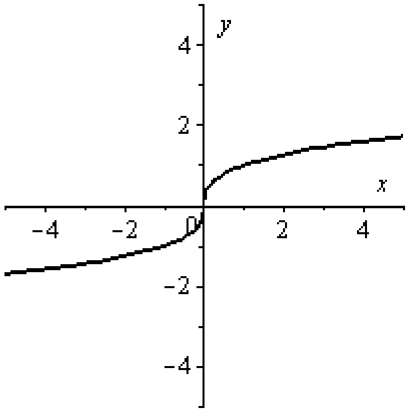
B) $y=3x+10$

C) $y=\frac{1}{3}x-\frac{2}{3}$

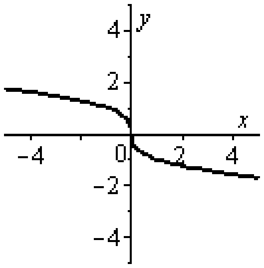
D) $y=-\frac{1}{3}x-\frac{10}{3}$

E) $y=-3x-14$

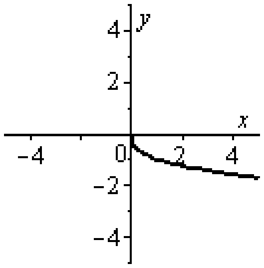
12. Match the graph of the function shown below with the graph of its inverse function



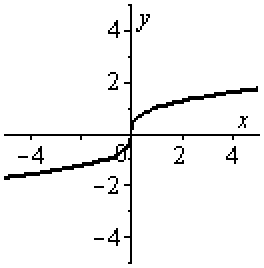
A)



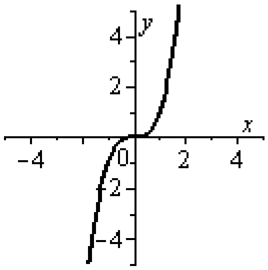
B)



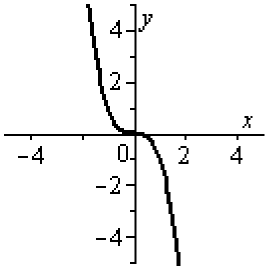
C)



D)

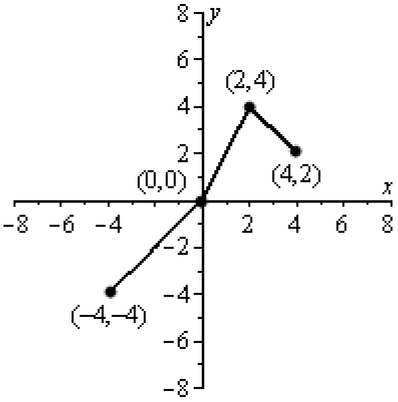


E)

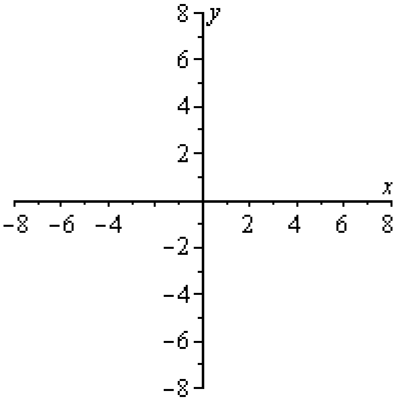


13. Use the graph of f to sketch the graph of the function indicated below.

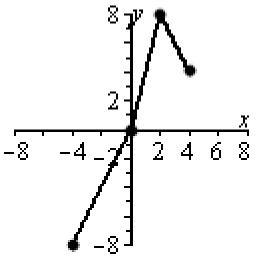
f



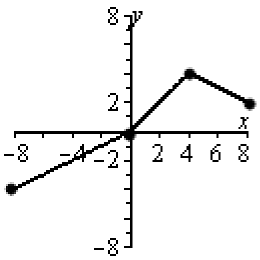
$y = \frac{1}{2} f(x)$



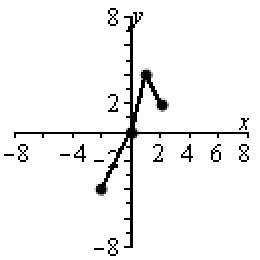
A)



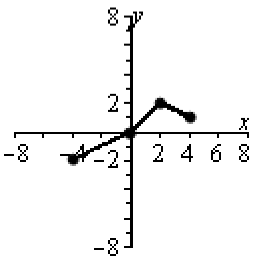
B)



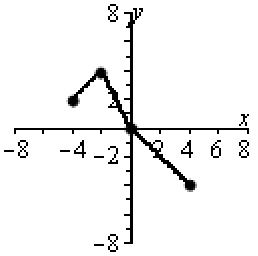
C)



D)



E)



14. Compare the graph of the following function with the graph of $f(x) = |x|$.

$$y = \left| \frac{7}{9} x \right|$$

A) vertical shift of $\frac{7}{9}$ units up

B) horizontal stretch of $\frac{9}{7}$ units

C) vertical shrink of $\frac{7}{9}$ units

D) horizontal shrink of $\frac{7}{9}$ units
vertical shift of $\frac{9}{7}$ units

E) horizontal shrink of $\frac{7}{9}$ units

15. Write the slope-intercept form of the equation of the line through the given point parallel to the given line.

    point: (3, –4) line: $28x + 7y = -4$

    A) $y = -\frac{1}{28}x - \frac{109}{28}$
    B) $y = \frac{1}{4}x - \frac{19}{4}$
    C) $y = 28x + 80$
    D) $y = -4x + 8$
    E) $y = -4x - 13$

16. Does the table describe a function?

Input value	5	10	13	10	5
Output value	–13	–9	0	9	13

    A) yes
    B) no

17. Show algebraically that the functions f and g shown below are inverse functions.

$$f(x) = -\frac{5}{7}x - 3, \quad g(x) = -\frac{7x+21}{5}$$

A)

$$\begin{aligned} f(g(x)) &= -\frac{5}{7}\left(\frac{7x+21}{5}\right) - 3 \\ &= \left(\frac{7x+21}{7}\right) - 3 \\ &= (x+3) - 3 \\ &= x + 3 - 3 \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= -\frac{7\left(-\frac{5}{7}x - 3\right) + 21}{5} \\ &= -\frac{(-5x-21)+21}{5} \\ &= \frac{-5x-21+21}{5} \\ &= \frac{5x}{5} \\ &= x \end{aligned}$$

B)

$$\begin{aligned} f(g(x)) &= -\frac{5}{7}\left(-\frac{7x+21}{5}\right) - 21 \\ &= \left(\frac{35x+21}{35}\right) - 21 \\ &= (x+21) - 21 \\ &= x + 21 - 21 \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= -\frac{7\left(-\frac{5}{7}x - 3\right) + 21}{5} \\ &= -\frac{(-5x-3)+21}{5} \\ &= \frac{5x+3-21}{5} \\ &= \frac{5x}{5} \\ &= x \end{aligned}$$

C)

$$\begin{aligned} f(g(x)) &= -\frac{5}{7}\left(-\frac{7x+3}{5}\right) - 3 \\ &= \left(\frac{35x+3}{35}\right) - 3 \\ &= (x+3) - 3 \\ &= x + 3 - 3 \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= -\frac{7\left(-\frac{5}{7}x - 3\right) + 21}{5} \\ &= -\frac{(-5x-3)+3}{5} \\ &= \frac{5x+3-3}{5} \\ &= \frac{5x}{5} \\ &= x \end{aligned}$$

D)

$$\begin{aligned} f(g(x)) &= -\frac{5}{7}\left(-\frac{7x+21}{5}\right)-3 \\ &= \left(\frac{7x+21}{7}\right)-3 \\ &= (x+3)-3 \\ &= x+3-3 \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= -\frac{7\left(-\frac{5}{7}x-3\right)+21}{5} \\ &= -\frac{(-5x-21)+21}{5} \\ &= \frac{5x+21-21}{5} \\ &= \frac{5x}{5} \\ &= x \end{aligned}$$

E)

$$\begin{aligned} f(g(x)) &= -\frac{7}{5}\left(-\frac{5x+15}{7}\right)-3 \\ &= \left(\frac{5x+15}{5}\right)-3 \\ &= (x+3)-3 \\ &= x+3-3 \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= -\frac{7\left(-\frac{5}{7}x-3\right)+21}{5} \\ &= -\frac{(-5x-3)+21}{35} \\ &= \frac{5x+3-21}{35} \\ &= \frac{35x}{35} \\ &= x \end{aligned}$$

18. Find the domain of the function.

$f(t)=\sqrt{64-t^2}$

A) $-8 \le t \le 8$
B) $t \le -8$ or $t \ge 8$
C) $t \ge 0$
D) $t \le 8$
E) all real numbers

19. Find the inverse function of f.

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

A) $f^{-1}(x) = -\sqrt[9]{x} - 2$
B) $f^{-1}(x) = \sqrt[9]{x} - 2$
C) $f^{-1}(x) = -\sqrt[9]{x - 2}$
D) $f^{-1}(x) = \sqrt[9]{x + 2}$
E) $f^{-1}(x) = \sqrt[9]{x} + 2$

20. Find $f \circ g$.

$f(x) = -4x + 3$ $\qquad g(x) = x + 7$

A) $(f \circ g)(x) = -4x - 25$
B) $(f \circ g)(x) = -4x + 10$
C) $(f \circ g)(x) = -4x^2 - 25x + 21$
D) $(f \circ g)(x) = -5x - 4$
E) $(f \circ g)(x) = -5x + 10$

Answer Key

1. A
2. A
3. A
4. A
5. B
6. E
7. A
8. C
9. D
10. C
11. B
12. D
13. D
14. B
15. D
16. B
17. D
18. A
19. D
20. A

Name: ___________________________ Date: _____________

1. Hooke's Law states that the force F required to compress or stretch a spring (within its elastic limits) is proportional to the distance d that the spring is compressed or stretched from its original length. That is, $F = kd$, where k is the measure of the stiffness of the spring and is called the *spring constant*. The table below shows the elongation d in centimeters of a spring when a force of F kilograms is applied.

Force, *F*	**Elongation, *d***
20	1.4
40	2.5
60	4.0
80	5.3
100	6.6

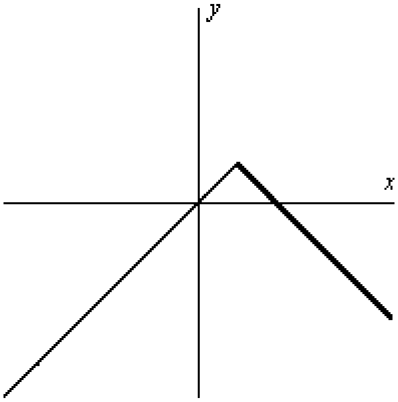
Find the equation of the line that seems to best fit the data. Use the model to estimate the elongation of the spring when a force of 55 kilograms is applied. Round your answer to one decimal place.
A) 7.2 centimeters
B) 5.4 centimeters
C) 1.8 centimeters
D) 3.6 centimeters
E) 2.7 centimeters

2. If f is an even function, determine if g is even, odd, or neither.
$g(x) = -f(x+3)$
A) even
B) odd
C) cannot be determined
D) neither

3. Given $f(x)=\dfrac{10}{x^2-9}$ and $g(x)=x+3$ determine the domain of $f\circ g$.

A) $(-\infty,-3)\cup(3,\infty)$
B) $(-\infty,-6)\cup(-6,0)\cup(0,\infty)$
C) $\left(-\infty,-\dfrac{10}{3}\right)\cup\left(\dfrac{10}{3},\infty\right)$
D) $(-\infty,-3)\cup(-3,3)\cup(3,\infty)$
E) $(-\infty,\infty)$

4. Determine an equation that may represented by the graph shown below.



A) $f(x)=|x+1|+1$
B) $f(x)=|x+1|-1$
C) $f(x)=-|x-1|+1$
D) $f(x)=|x-1|+1$
E) $f(x)=|x-1|-1$

5. Find all real values of x such that $f(x) = 0$.

$f(x) = 49x^2 - 64$

A) $\pm\frac{7}{8}$
B) $\pm\frac{8}{7}$
C) $\pm\frac{64}{49}$
D) $-\frac{64}{49}$
E) $\frac{8}{7}$

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

$f(x) = -8x^2 + 5x - 2$
$g(x) = 4x^2 + 7x + 4$

A) $(f+g)(x) = -12x^4 - 2x^2 - 6$
B) $(f+g)(x) = -4x^4 + 12x^2 + 2$
C) $(f+g)(x) = -12x^2 - 2x - 6$
D) $(f+g)(x) = -4x^2 + 12x + 2$
E) $(f+g)(x) = 4x^2 - 12x - 2$

7. Find $f \circ g$.

$f(x) = x + 4 \qquad g(x) = \dfrac{3}{x^2 - 16}$

A) $(f \circ g)(x) = \dfrac{3}{x^2}$

B) $(f \circ g)(x) = \dfrac{3}{x^2 + 8x}$

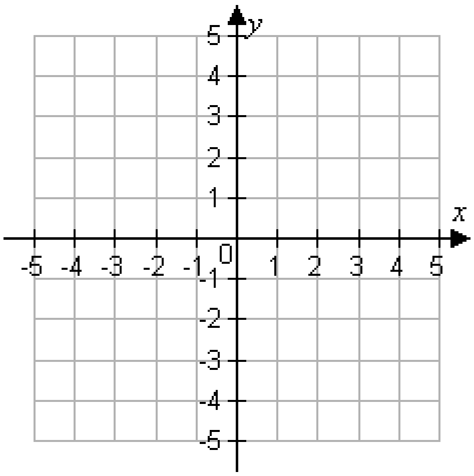
C) $(f \circ g)(x) = \dfrac{4x^2 - 1}{x^2 - 16}$

D) $(f \circ g)(x) = \dfrac{7}{x^2 - 16}$

E) $(f \circ g)(x) = \dfrac{4x^2 - 61}{x^2 - 16}$

8. Graph the function and determine the interval(s) for which $f(x) \geq 0$.

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



A) $(-\infty, 0] \cup [4, \infty)$

B) $[0, 4]$

C) $(0, 4)$

D) $(-\infty, 0) \cup (4, \infty)$

E) $\{4\}$

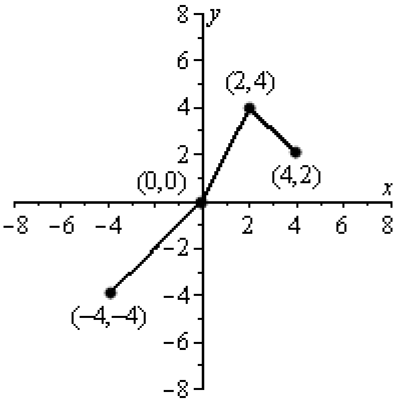
9. Restrict the domain of the following function f so that the function is one-to-one and has an inverse function.

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

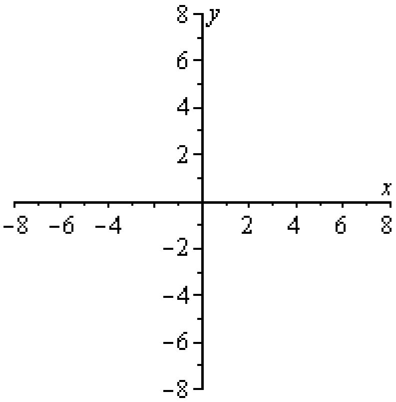
   A) $[-4, \infty)$
   B) $[2, 4]$
   C) $[4, \infty)$
   D) $[-2, 4]$
   E) $(-\infty, 2]$

10. Use the graph of f to sketch the graph of the function indicated below.

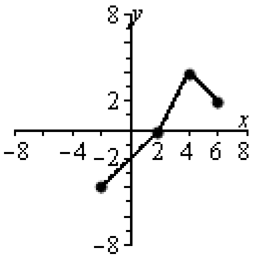
f



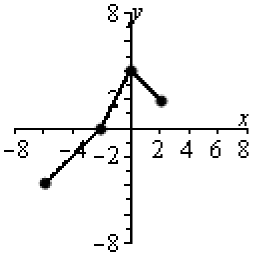
$y = 2f(x+2)$



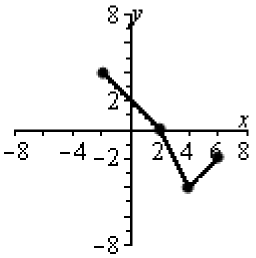
A)



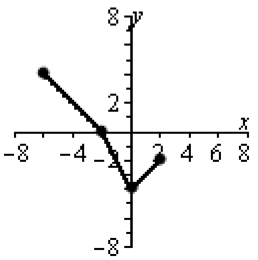
B)



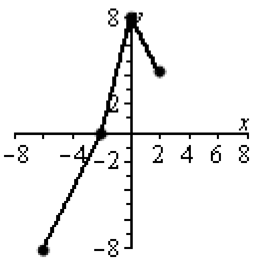
C)



D)



E)



11. Algebraically determine whether the function below is even, odd, or neither.

$f(s) = 8s^{7/6}$

A) even
B) odd
C) cannot be determined
D) neither

12. Compare the graph of the following function with the graph of $f(x) = \sqrt{x}$.

$y = \sqrt{-x+4}$

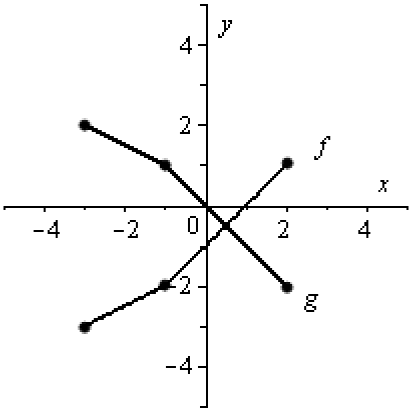
A) First a vertical shift of 4 units up then a reflection in the y-axis.
B) First a horizontal shift of 4 units to the left then a reflection in the y-axis.
C) First a vertical shift of 4 units up then a reflection in the x-axis.
D) First a horizontal shift of 4 units to the left, then a vertical shift of 4 units up and then a reflection in the y-axis.
E) First a horizontal shift of 4 units to the left then a reflection in the x-axis.

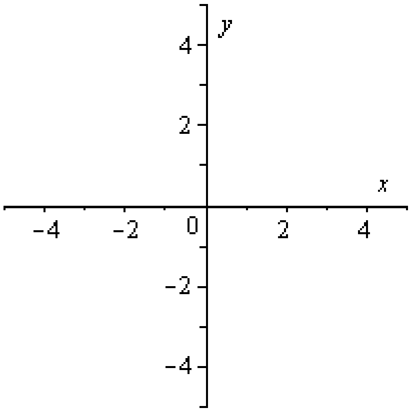
13. Find the domain of the function.

$$g(p) = \sqrt{4 - p^2}$$

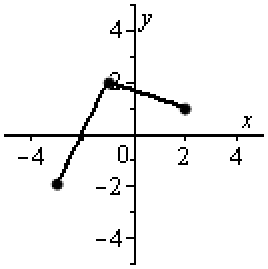
A) $-2 \le p \le 2$
B) $p \le -2$ or $p \ge 2$
C) $p \ge 0$
D) $p \le 2$
E) all real numbers

14. Use the graphs of f and g, shown below, to graph $h(x)=(f+g)(x)$.

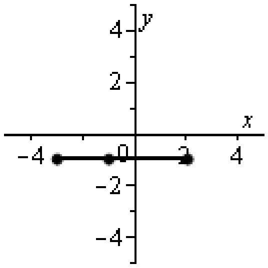




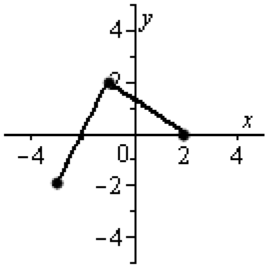
A)



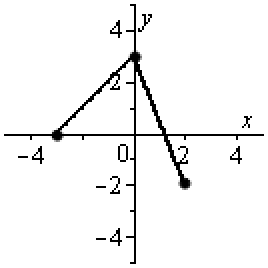
B)



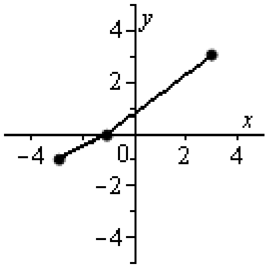
C)



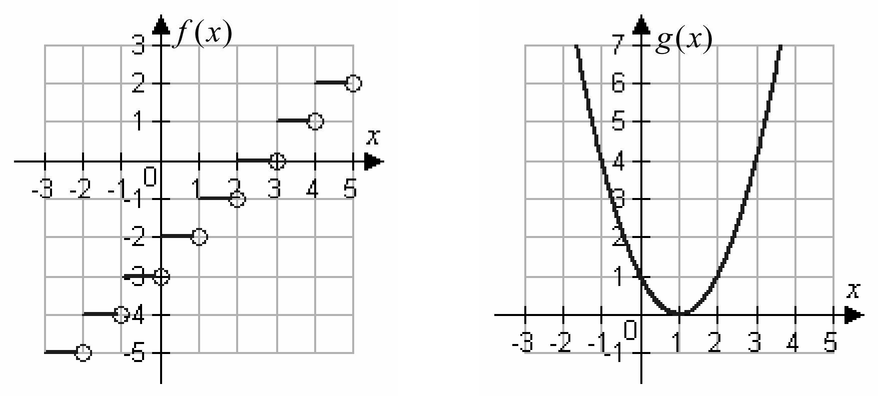
D)



E)



15. Use the graphs of f and g to evaluate the function.



$(f \circ g)(1)$

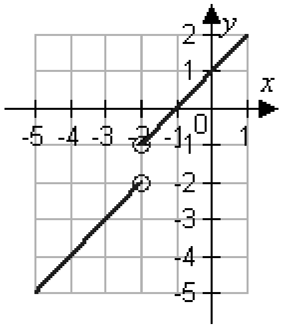
A) 9
B) –1
C) 0
D) –4
E) –2

16. Find the slope and y-intercept of the equation of the line.

$y = -2x - 9$

A) slope: $-\dfrac{1}{2}$; y-intercept: –9
B) slope: $-\dfrac{1}{9}$; y-intercept: –2
C) slope: –2; y-intercept: –9
D) slope: –9; y-intercept: –2
E) slope: –2; y-intercept: 9

17. Use the graph of the function to find the domain and range of f.



A)
domain : all real numbers
range : $(-\infty,-2)\cup(-1,\infty)$

B)
domain : all real numbers
range : all real numbers

C)
domain : $(-\infty,-2)\cup(-2,\infty)$
range : $(-\infty,-2)\cup(-1,\infty)$

D)
domain : $(-\infty,-2)\cup(-1,\infty)$
range : $(-\infty,-2)\cup(-2,\infty)$

E)
Domain: all real numbers
Range: $(-\infty,-2]\cup[-1,\infty)$

18. Given that $f(x)=\sqrt[4]{x-4}$ and $g(x)=x^4+4$ determine the value of the following (if possible).

$(f \circ g)(0)$

A) 0
B) 2
C) 4
D) x^4-16
E) not possible

19. Find the inverse function of $f(x)=8x+3$

A) $g(x)=\dfrac{x-3}{8}$
B) $g(x)=3x+8$
C) $g(x)=\dfrac{x+3}{8}$
D) $g(x)=\dfrac{x}{3}$
E) $g(x)=\dfrac{1}{8}x-3$

20. Show algebraically that the functions f and g shown below are inverse functions.

$$f(x)=\frac{2}{2+x},\ x\geq 0,\quad g(x)=\frac{2-2x}{x},\ 0<x\leq 1$$

A)

$$\begin{aligned} f(g(x)) &= \frac{2}{2+\left(\frac{2-2x}{x}\right)} \\ &= \frac{2}{2+\left(\frac{1}{x}\right)} \\ &= \frac{1}{\left(\frac{1}{x}\right)} \\ &= 1\cdot\frac{x}{1} \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= \frac{2-2\left(\frac{2}{2+x}\right)}{\left(\frac{2}{2+x}\right)} \\ &= \frac{0-\left(\frac{2}{2+x}\right)}{\left(\frac{2}{2+x}\right)} \\ &= \frac{\frac{-2}{2+x}}{\left(\frac{2}{2+x}\right)} \\ &= \left(\frac{-2}{2+x}\right)\left(\frac{2+x}{2}\right) \\ &= \frac{2x+2}{2+x} \\ &= x \end{aligned}$$

B)

$$f(g(x)) = \frac{2}{2+\left(\frac{2-2x}{x}\right)} = \frac{1}{1+\frac{2-2x}{x}} = \frac{1}{\left(\frac{0}{x}\right)} = x$$

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

C)

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

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

D)

$$\begin{aligned} f(g(x)) &= \frac{2}{2+\left(\frac{2-2x}{x}\right)} \\ &= \frac{2}{\frac{2x+2-2x}{x}} \\ &= \frac{2-2x}{\left(\frac{2}{x}\right)} \\ &= \frac{1-x}{1} \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= \frac{2-2\left(\frac{2}{2+x}\right)}{\left(\frac{2}{2+x}\right)} \\ &= \frac{\left(\frac{4}{2+x}\right)}{\left(\frac{2}{2+x}\right)} \\ &= \left(\frac{4}{2+x}\right)\left(\frac{2+x}{2}\right) \\ &= \frac{2(2+x)}{2+x} \\ &= \frac{2x}{2} \\ &= x \end{aligned}$$

E)

$$\begin{aligned} f(g(x)) &= \frac{2}{2+\left(\frac{2-2x}{x}\right)} \\ &= \frac{2}{\frac{2x+2-2x}{x}} \\ &= \frac{2}{\left(\frac{2}{x}\right)} \\ &= 2\cdot\frac{x}{2} \\ &= x \end{aligned}$$

$$\begin{aligned} g(f(x)) &= \frac{2-2\left(\frac{2}{2+x}\right)}{\left(\frac{2}{2+x}\right)} \\ &= \frac{2-\left(\frac{4}{2+x}\right)}{\left(\frac{2}{2+x}\right)} \\ &= \frac{\frac{4+2x-4}{2+x}}{\left(\frac{2}{2+x}\right)} \\ &= \frac{\frac{2x}{2+x}}{\left(\frac{2}{2+x}\right)} \\ &= \frac{2x}{2} \\ &= x \end{aligned}$$

Answer Key

1. D
2. C
3. B
4. C
5. B
6. D
7. E
8. B
9. C
10. E
11. D
12. B
13. A
14. B
15. E
16. C
17. C
18. A
19. A
20. E