

Name \_\_\_\_\_

**Determine whether the relation represents a function. If it is a function, state the domain and range.**

1)  $\{(-3, 10), (-2, 5), (0, 1), (2, 5), (4, 17)\}$

2)  $\{(19, -4), (3, -3), (3, 0), (12, 3), (28, 5)\}$

**Find the value for the function.**

3) Find  $f(-x)$  when  $f(x) = 3x^2 - 3x - 2$ .

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

**Find the domain of the function.**

5)  $h(x) = \frac{x - 4}{x^3 - 16x}$

6)  $f(x) = \sqrt{13 - x}$

**For the given functions f and g, find the requested function and state its domain.**

7)  $f(x) = \sqrt{x}$ ;  $g(x) = 4x - 7$

Find  $\frac{f}{g}$ .

**Solve the problem.**

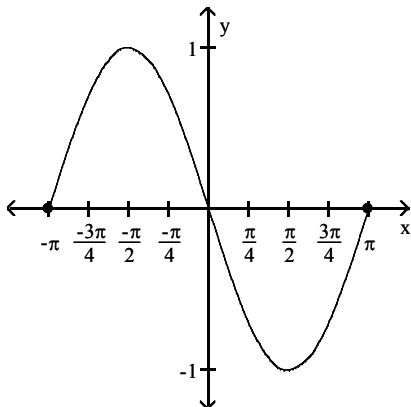
8) Find  $(f - g)(4)$  when  $f(x) = -3x^2 + 2$  and  $g(x) = x + 6$ .

**Find and simplify the difference quotient of  $f$ ,  $\frac{f(x+h) - f(x)}{h}$ ,  $h \neq 0$ , for the function.**

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

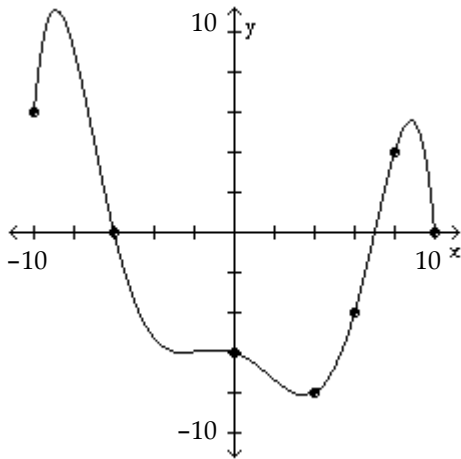
**Determine whether the graph is that of a function. If it is, use the graph to find its domain and range, the intercepts, if any, and any symmetry with respect to the x-axis, the y-axis, or the origin.**

10)

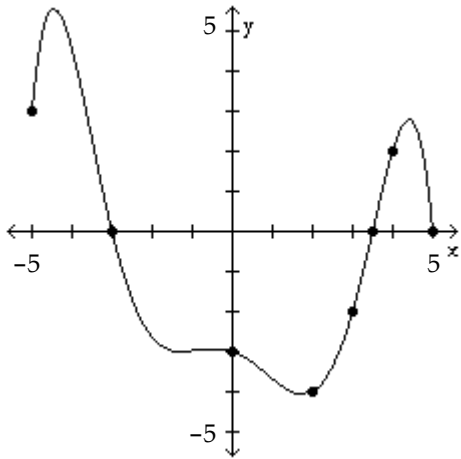


The graph of a function  $f$  is given. Use the graph to answer the question.

11) Is  $f(6)$  positive or negative?

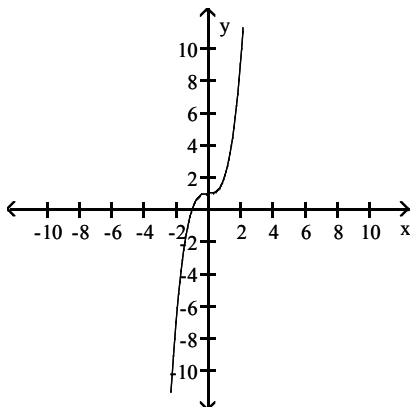


12) For what numbers  $x$  is  $f(x) < 0$ ?



The graph of a function is given. Decide whether it is even, odd, or neither.

13)

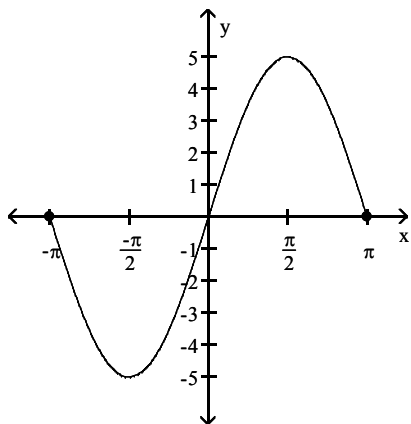


A) even

B) odd

C) neither

14)

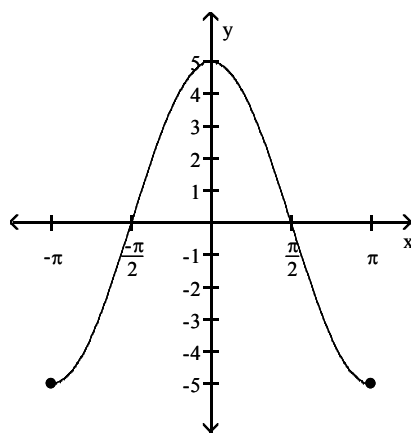


A) even

B) odd

C) neither

15)



A) even

B) odd

C) neither

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

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

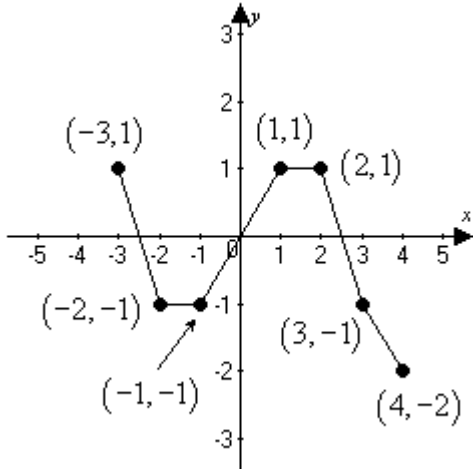
A) even

B) odd

C) neither

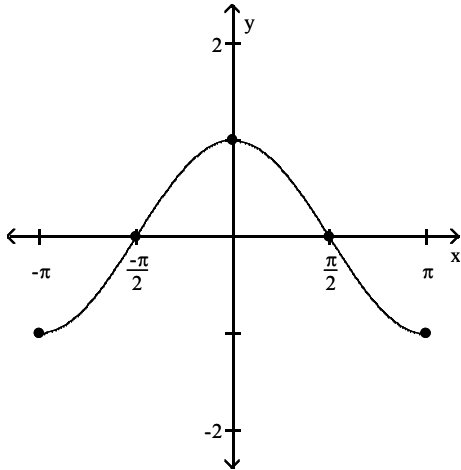
Use the graph to find the intervals on which it is increasing, decreasing, or constant.

17)



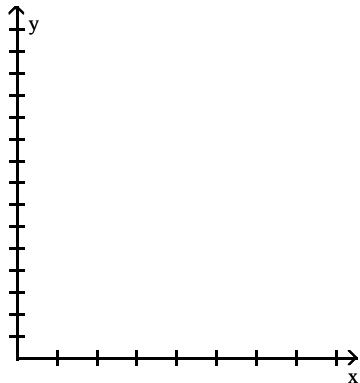
The graph of a function  $f$  is given. Use the graph to answer the question.

18) Find the numbers, if any, at which  $f$  has a local minimum. What are the local minima?



Solve the problem.

19) The height  $s$  of a ball (in feet) thrown with an initial velocity of 70 feet per second from an initial height of 3 feet is given as a function of time  $t$  (in seconds) by  $s(t) = -16t^2 + 70t + 3$ . What is the maximum height? Round to the nearest hundredth, if necessary.



Find the average rate of change for the function between the given values.

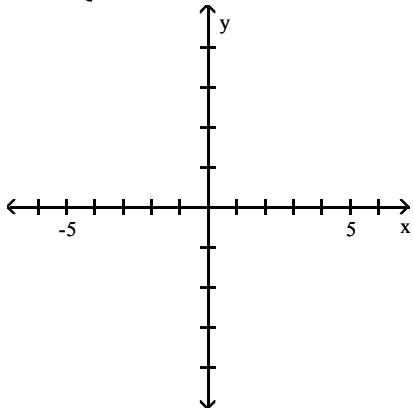
20)  $f(x) = x^3 + x^2 - 8x - 7$ ; from 0 to 2

Find an equation of the secant line containing (1, f(1)) and (2, f(2)).

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

Graph the function.

22)  $f(x) = \begin{cases} -x + 2 & \text{if } x < 0 \\ \sqrt{x} + 3 & \text{if } x \geq 0 \end{cases}$



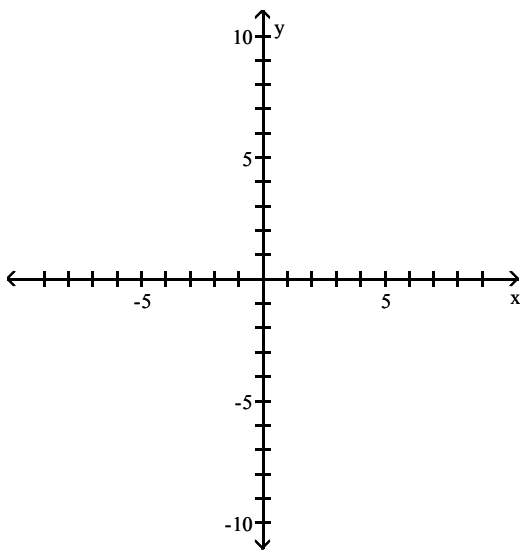
Graph the function and evaluate at the indicated values of x. Identify the domain and the range and find the intercepts if any.

23)  $f(x) = \begin{cases} x + 3 & \text{if } -8 \leq x < 4 \\ -9 & \text{if } x = 4 \\ -x + 7 & \text{if } x > 4 \end{cases}$

$f(-8) =$  ;  $f(0) =$  ;  $f(4) =$  ;  $f(5) =$  ;  $f(6) =$

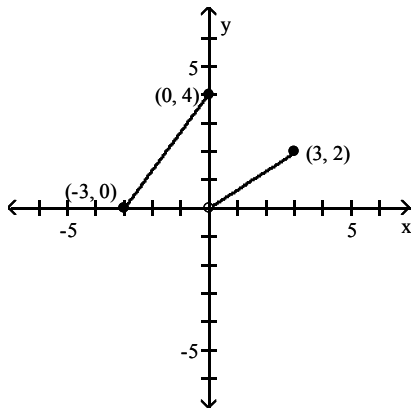
y-intercept: ; x-intercepts:

Domain: ; Range:



The graph of a piecewise-defined function is given. Write a definition for the function.

24)



**Solve the problem.**

25) An electric company has the following rate schedule for electricity usage in single-family residences:

Monthly service charge	\$4.93
Per kilowatt service charge	
1st 300 kilowatts	\$0.11589/kW
Over 300 kilowatts	\$0.13321/kW

What is the charge for using 300 kilowatts in one month?

What is the charge for using 375 kilowatts in one month?

Construct a function that gives the monthly charge  $C$  for  $x$  kilowatts of electricity.

**Answer the question.**

26) How can the graph of  $f(x) = \frac{1}{2}(x + 4)^2 - 5$  be obtained from the graph of  $y = x^2$ ?

**Write an equation for a function that has a graph with the given characteristics.**

27) The shape of  $y = \sqrt{x}$  is shifted 5 units to the left. Then the graph is shifted 7 units upward.

28) The shape of  $y = x^2$  is vertically stretched by a factor of 3, and the resulting graph is reflected across the  $x$ -axis.

29) Find the function that is finally graphed after the following transformations are applied to the graph of

$$y = x^2.$$

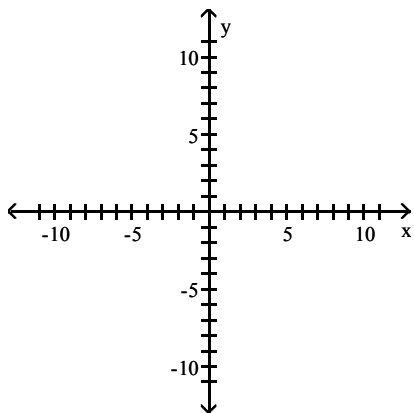
- 1) Shift left 3 units
- 2) Stretched by a factor of 2
- 3) Reflect about the x-axis
- 4) Shift up 5 units

**Graph the function by starting with the graph of the basic function and then using the techniques of shifting, compressing, stretching, and/or reflecting.**

30)  $f(x) = \sqrt{x - 5} - 3$

Basic function  $y = \sqrt{x}$   
x | y

$f(x) =$   
x | y



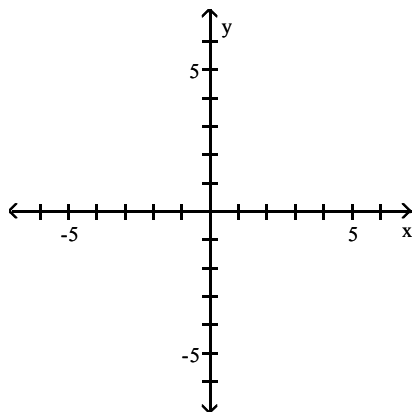
31)  $f(x) = \sqrt{-x} + 2$

Basic function  $y = \sqrt{x}$

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

x | y

x | y



Graph the function by starting with the graph of the basic function and then using the techniques of shifting, compressing, stretching, and/or reflecting. Find the x and y-intercepts if any and use the graph to find the domain and the range of the function.

32)  $f(x) = \sqrt{x - 5} - 6$

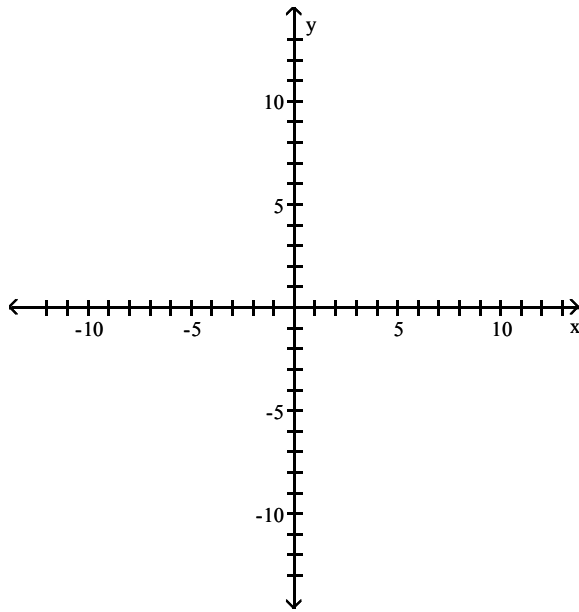
Basic function  $y = \sqrt{x}$   
x | y

$f(x) = \sqrt{x - 5} - 6$   
x | y

x-intercept: \_\_\_\_\_

y-intercept: \_\_\_\_\_

Domain: \_\_\_\_\_; Range: \_\_\_\_\_





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

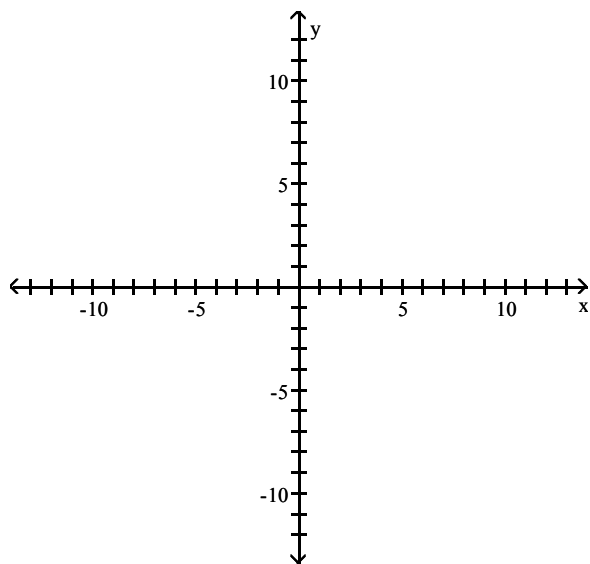
Basic Function  $y = x^2$   
x | y

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

x-intercept(s): \_\_\_\_\_

y-intercept: \_\_\_\_\_

Domain: \_\_\_\_\_; Range: \_\_\_\_\_



Graph the function by starting with the graph of the basic function and then using the techniques of shifting, compressing, stretching, and/or reflecting. Find the x and y-intercepts if any; then, use the graph to find the domain and the range of the function.

34)  $f(x) = |x + 6| - 5$

Basic function  $y = |x|$

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

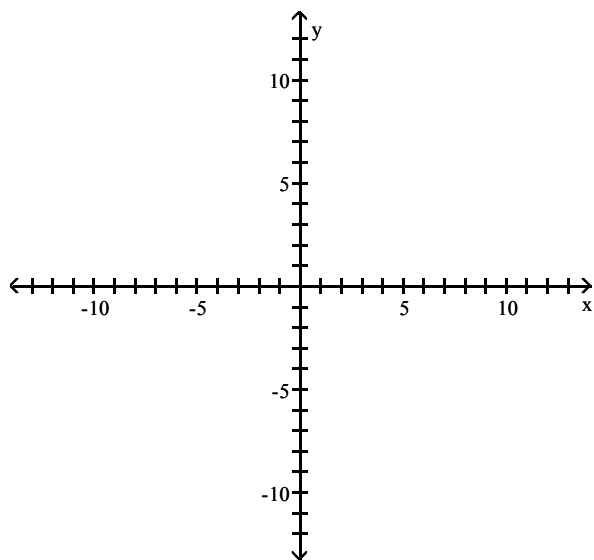
x | y

x | y

x-intercept(s): \_\_\_\_\_

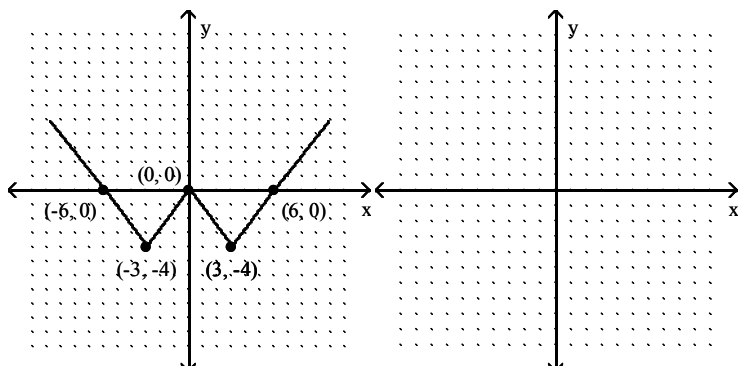
y-intercept: \_\_\_\_\_

Domain: \_\_\_\_\_; Range: \_\_\_\_\_



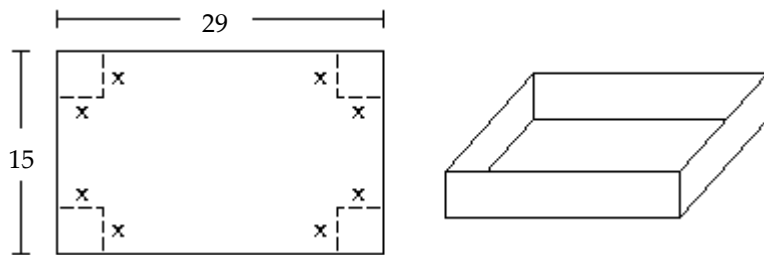
A graph of  $y = f(x)$  follows. No formula for  $f$  is given. Make a hand-drawn graph of the equation.

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



**Solve the problem.**

- 36) A box with an open top is to be constructed from a rectangular piece of cardboard with dimensions 15 inches by 29 inches by cutting out equal squares of side  $x$  at each corner and then folding up the sides as in the figure. Express the volume  $V$  of the box as a function of  $x$ .



- 37) A farmer has 1200 yards of fencing to enclose a rectangular garden. Express the area  $A$  of the rectangle as a function of the width  $x$  of the rectangle. What is the domain of  $A$ ?

# Answer Key

Testname: 105P2.0121

1) function

domain:  $\{-3, -2, 0, 2, 4\}$

range:  $\{10, 5, 1, 17\}$

2) not a function

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

4)  $-2x^2 + 3x - 4$

5)  $\{x \mid x \neq -4, 0, 4\}$

6)  $\{x \mid x \leq 13\}$

7)  $\left(\frac{f}{g}\right)(x) = \frac{\sqrt{x}}{4x-7}; \{x \mid x \geq 0, x \neq \frac{7}{4}\}$

8) -56

9)  $2x + h + 7$

10) function

domain:  $\{x \mid -\pi \leq x \leq \pi\}$

range:  $\{y \mid -1 \leq y \leq 1\}$

intercepts:  $(-\pi, 0), (0, 0), (\pi, 0)$

symmetry: origin

11) negative

12)  $(-3, 3.5)$

13) C

14) B

15) A

16) B

17) Decreasing on  $(-3, -2)$  and  $(2, 4)$ ; increasing on  $(-1, 1)$ ; constant on  $(-2, -1)$  and  $(1, 2)$

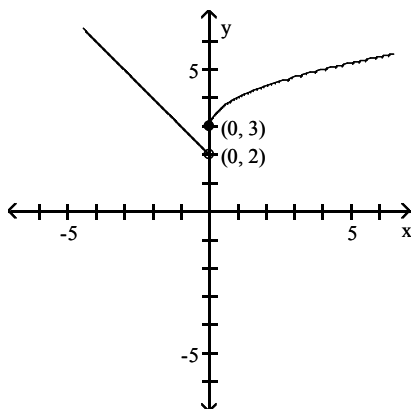
18)  $f$  has a local minimum at  $x = -\pi$  and  $\pi$ ; the local minimum is -1

19) 79.56 ft

20) -2

21)  $y = 6x - 6$

22)



# Answer Key

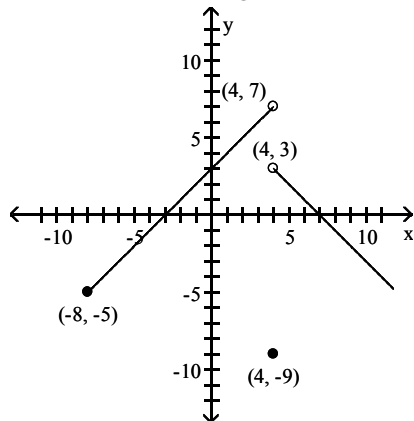
Testname: 105P2.0121

23)

$$f(-8) = -5 \quad ; \quad f(0) = 3 \quad ; \quad f(4) = -9 \quad ; \quad f(5) = 2 \quad ; \quad f(6) = 1$$

y-intercept:(0,3); x-intercepts: (-3,0) and (7,0)

Domain:[-8,∞); Range: (-∞,7)



$$24) f(x) = \begin{cases} \frac{4}{3}x + 4 & \text{if } -3 \leq x \leq 0 \\ \frac{2}{3}x & \text{if } 0 < x \leq 3 \end{cases}$$

25) \$39.70

\$49.69

$$C(x) = \begin{cases} 4.93 + 0.11589x & \text{if } 0 \leq x \leq 300 \\ -0.266 + 0.13321x & \text{if } x > 300 \end{cases}$$

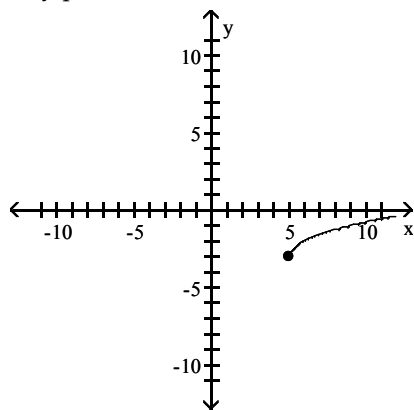
26) Shift it horizontally 4 units to the left. Shrink it vertically by a factor of  $\frac{1}{2}$ . Shift it 5 units down.

27)  $f(x) = \sqrt{x+5} + 7$

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

29)  $y = -2(x+3)^2 + 5$

30) Key points of basic function: (0, 0), (1, 1), (4, 2) ---> (5, -3), (6, -2), (9, -1) (corresponding points on f(x))

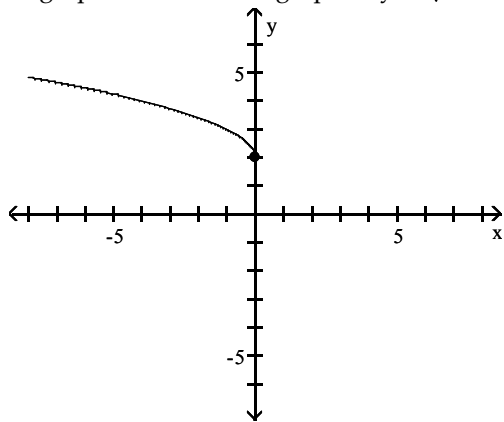


# Answer Key

Testname: 105P2.0121

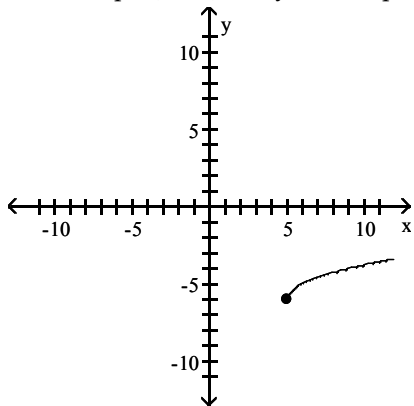
31) Key points of basic function:  $(0, 0), (1, 1), (4, 2) \rightarrow (0, 2), (-1, 3), (-4, 5)$  (corresponding points of  $f(x)$ )

Note: Final graph should be the graph of  $y = \sqrt{-x}$  shifted upward 2 units.



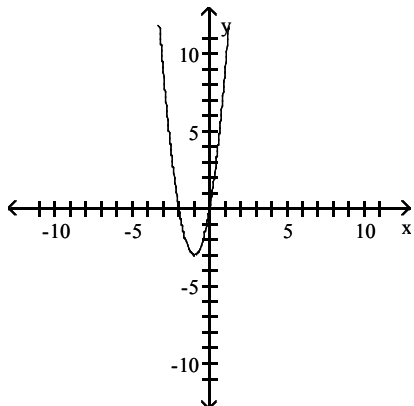
32) Key points of basic function:  $(0, 0), (1, 1), (4, 2) \rightarrow (5, -6), (6, -5), (9, -4)$  (corresponding points on  $f(x)$ )

x-intercept:  $(41, 0)$ ; No y-intercept; Domain  $[5, \infty)$ ; Range:  $[-6, \infty)$



33) Key points of basic function:  $(-1, 1), (0, 0), (1, 1) \rightarrow (-2, 0), (-1, -3), (0, 0)$  (corresponding points of  $f(x)$ )

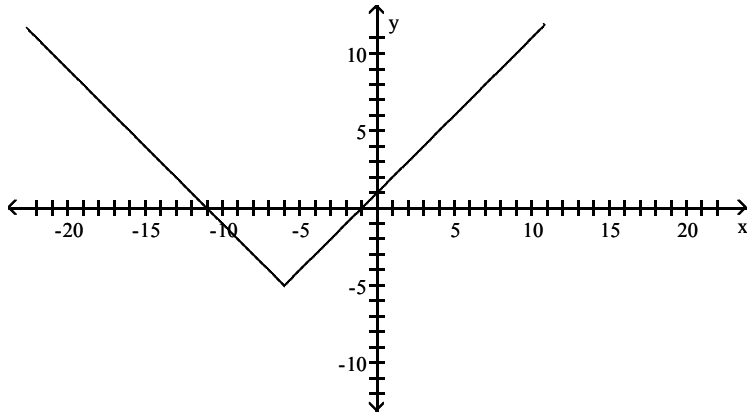
x-intercepts:  $(-2, 0), (0, 0)$ ; y-intercept:  $(0, 0)$



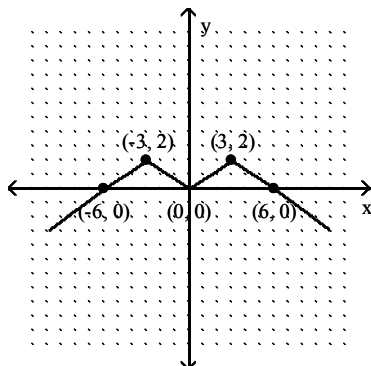
# Answer Key

Testname: 105P2.0121

- 34) Key points of  $y = |x|$ :  $(-1, 1)$ ,  $(0, 0)$ ,  $(1, 1)$  Corresponding points of  $f(x)$   $(-7, -4)$ ,  $(-6, -5)$ ,  $(-5, -4)$   
x-intercepts:  $(-11, 0)$ ,  $(-1, 0)$ ; y-intercept:  $(0, 1)$   
Domain: All Reals; Range:  $[-5, \infty)$



35)



36)  $V(x) = x(15 - 2x)(29 - 2x)$

37)  $A(x) = -x^2 + 600x$ ;  $\{x \mid 0 < x < 600\}$