

Review Ch 1/2/3 *Solve; +3*

1)  $x^2 - 2x > 8$

2)  $|x + 4| - 7 > -2$

3)  $\frac{2x - 5}{x + 1} < 0$

**Identify the center and radius of each.**

4)  $x^2 + y^2 - 4x + 24y + 144 = 0$

**Find the symmetry of each of the following equations. Show how you use the symmetry tests to find your answers.**

5)  $xy = 3$

6)  $y = x^2 - 3$

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

8)  $y = x^3 + 2x - 4$

9) passes through  $(-2, -11)$  and perpendicular to the line passing through  $(1, 1)$  and  $(5, -1)$

10) passes through  $(0, 6)$  and parallel to the line  $2x + 3y + 4 = 0$

11) At the surface of the ocean, the water pressure is the same as the air pressure above the water, 15 lb/in. Below the surface the water pressure increases by 4.34 lb/in for every 10 feet of descent.

- Find an equation for the relationship between pressure and depth below the ocean surface.
- What do the slope and y-intercept represent?
- At what depth is the pressure 100 lb/in

12) If  $f(x) = x^2 - \sqrt{x + 2} - 1$ , find:

a)  $f(0)$

b)  $f(-1)$

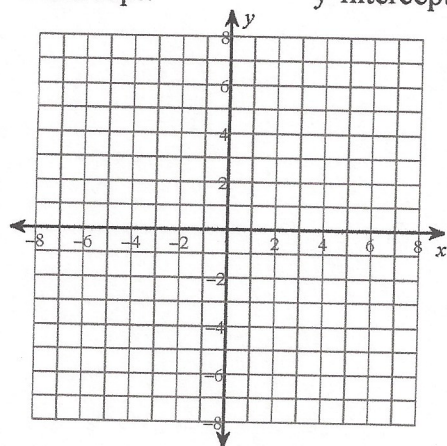
a)  $f(a)$

b)  $f(a - 1)$

Sketch the graph of the following functions without using a calculator. Use a table of values, symmetry or identify several key points to help you. Find the x- and y-intercepts as well as the domain and the range

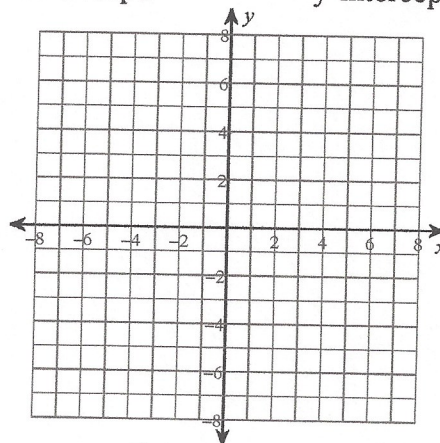
13)  $f(x) = 3x^2 + 3x - 6$

Domain: Range:  
x-intercept: y-intercept:



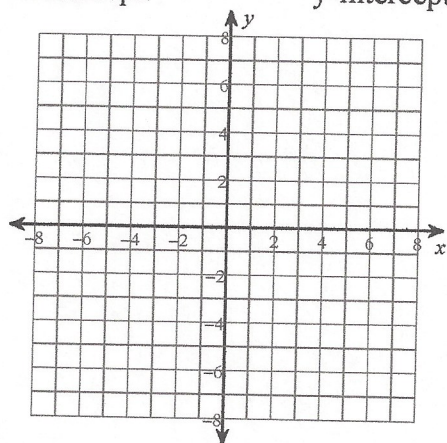
14)  $f(x) = 2|x + 2| - 4$

Domain: Range:  
x-intercept: y-intercept:



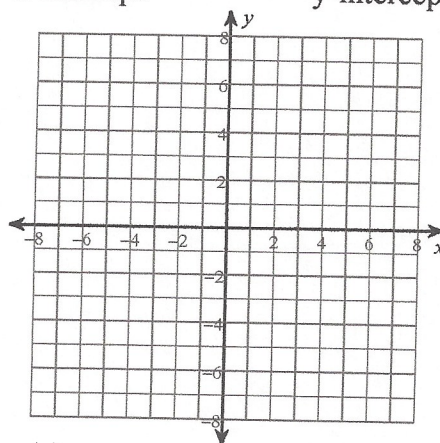
15)  $f(x) = 4$

Domain: Range:  
x-intercept: y-intercept:



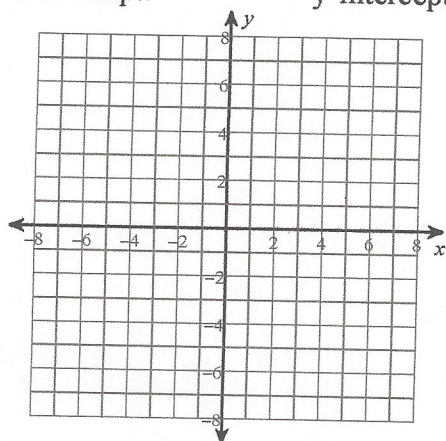
16)  $f(x) = \sqrt{x} - 3$

Domain: Range:  
x-intercept: y-intercept:



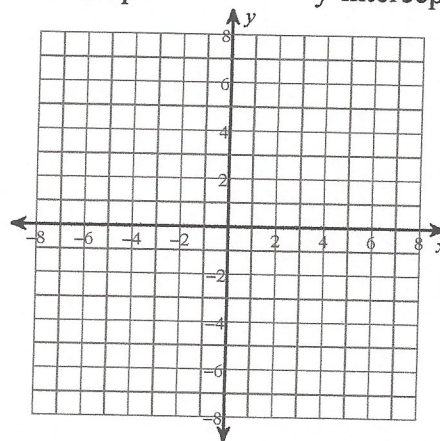
17)  $f(x) = \frac{2}{3}x + 2$

Domain: Range:  
x-intercept: y-intercept:



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

Domain: Range:  
x-intercept: y-intercept:



**Find the average rate of change of the function between the given points.**

19)  $f(x) = |x + 1|$

$x = -5, x = 0$

20)  $f(x) = \frac{1}{x} + 8$

$x = -3, x = 6$

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

$x = 6, x = 10$

**Write a function  $f(x)$  that has the following transformations:**

22) Shifted right 3 units, down 4 units, and stretched by a factor of 3

23) Shifted left 1 unit, up 7 units, and stretched by a factor of  $\frac{1}{2}$

24) Reflected in the x-axis and shifted down 2.

25) Reflected in the y-axis and stretched by a factor of 9.

**Show Algebraically how to determine whether  $f(x)$  is even, odd, or neither.**

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

27)  $f(x) = \sqrt[3]{x} + x$

28)  $f(x) = -2$

29)  $f(x) = x^{-3} + x - 1$

30)  $f(x) = 2x^2 - x^6$

31)  $f(x) = \sqrt[5]{x}$

Complete the square to write the quadratic function in standard (vertex) form. Identify the vertex and find the maximum or minimum value of each function.

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

33)  $f(x) = 2x^2 - 6x + 1$

Standard Form: \_\_\_\_\_

Standard Form: \_\_\_\_\_

Vertex: \_\_\_\_\_

Vertex: \_\_\_\_\_

Max or Min: \_\_\_\_\_

Max or Min: \_\_\_\_\_

34)  $f(x) = 2x^2 + 5x - 4$

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

Standard Form: \_\_\_\_\_

Standard Form: \_\_\_\_\_

Vertex: \_\_\_\_\_

Vertex: \_\_\_\_\_

Max or Min: \_\_\_\_\_

Max or Min: \_\_\_\_\_

Combine the functions if  $f(x) = 2 + x$   $g(x) = \frac{1}{x}$ . Identify the Domain

36)  $f(x) + 2g(x)$

37)  $f(x) \cdot g(x)$

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

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

40)  $\left(\frac{f}{g}\right)(x)$

41)  $\left(\frac{g}{f}\right)(x)$

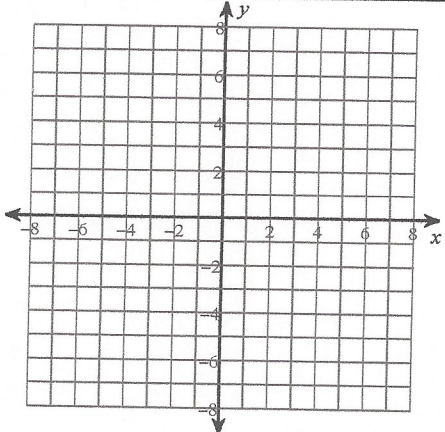
Find the inverse of each function (if one exists). State the domains of the original function and its inverse. Then sketch both functions.

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

Domain of  $f(x)$ : \_\_\_\_\_

$f^{-1}(x) =$  \_\_\_\_\_

Domain of  $f^{-1}(x)$ : \_\_\_\_\_

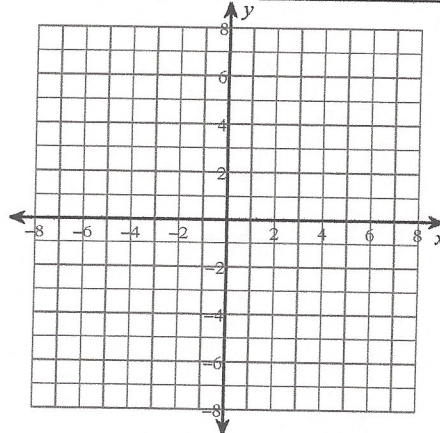


43)  $f(x) = -\sqrt{x+1}$

Domain of  $f(x)$ : \_\_\_\_\_

$f^{-1}(x) =$  \_\_\_\_\_

Domain of  $f^{-1}(x)$ : \_\_\_\_\_

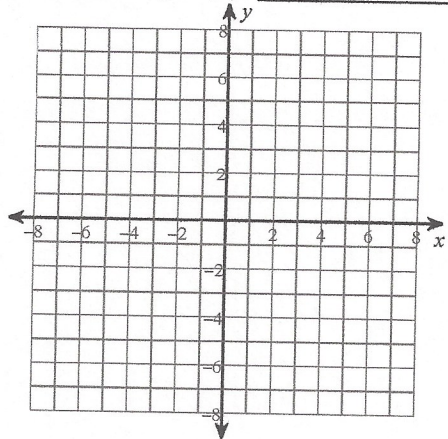


44)  $f(x) = 5 - x^2$

Domain of  $f(x)$ : \_\_\_\_\_

$f^{-1}(x) =$  \_\_\_\_\_

Domain of  $f^{-1}(x)$ : \_\_\_\_\_

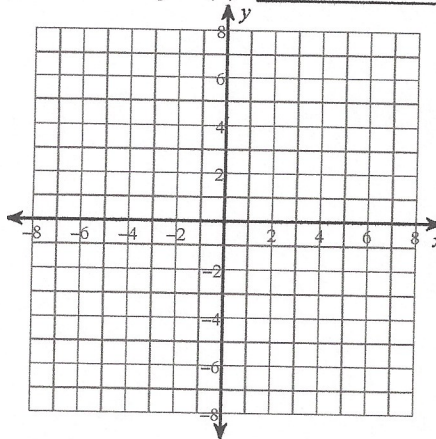


45)  $f(x) = x^3 - 2$

Domain of  $f(x)$ : \_\_\_\_\_

$f^{-1}(x) =$  \_\_\_\_\_

Domain of  $f^{-1}(x)$ : \_\_\_\_\_



**Verify by composition that the two given functions are inverses of each other.**

46)  $f(x) = 2x - 1$  and  $g(x) = \frac{x + 1}{2}$

47)  $f(x) = x^4 + 2$  and  $g(x) = \sqrt[4]{x - 2}$

48) Show that  $f(x) = \frac{1}{x}$  is its own inverse.

49) A soft drink vendor at a popular beach analyzes his sales record, and finds that if he sales  $x$  cans of soda pop in one day, his profit (in dollars) can be modeled by the function:

$$P(x) = -0.001x^2 + 3x - 1800$$

What is the maximum profit per day, and how many cans must he sell for maximum profit?

50) For his services, a private investigator requires a \$500 retention fee plus \$80 per hour. Let  $x$  represent the number of hours the investigator spends working on a case.

A) Find a function  $f(x)$  that models the investigator's fee as a function of  $x$ .

B) Find  $f^{-1}(x)$ , what does  $f^{-1}(x)$  represent?

C) Find  $f^{-1}(1220)$ . What does your answer represent?

Review Ch 1/2/3

Solve

1)  $x^2 - 2x > 8$

$x^2 - 2x - 8 > 0$

$(x-4)(x+2) > 0$   $(-\infty, -2) \cup (4, \infty)$

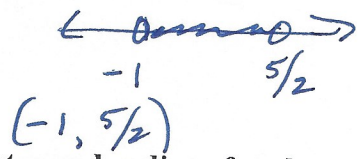


2)  $|x+4| - 7 > -2$

$|x+4| > 5$

$x+4 > 5$   $x+4 < -5$   
 $x > 1$   $x < -9$

3)  $\frac{2x-5}{x+1} < 0$



Identify the center and radius of each.

4)  $x^2 + y^2 - 4x + 24y + 144 = 0$

$x^2 - 4x + 4 + y^2 + 24y + 144 = -144 + 4 + 144$

$C(2, -12)$  radius = 2  $(x-2)^2 + (y+12)^2 = 4$

Find the symmetry of each of the following equations. Show how you use the symmetry tests to find your answers.

5)  $xy = 3$

Syn x-axis:  $x(-y) = 3$  NO  
 Syn y-axis:  $(-x)y = 3$  NO

Syn origin:  $(-x)(-y) = 3$  YES  
 $xy = 3$  YES

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

origin:  $-y = -3(-x+1)^2$  NO  
 x-axis:  $-y = -3(x+1)^2$  NO  
 y-axis:  $y = -3(-x+1)^2$  NO

6)  $y = x^2 - 3$

origin:  $-y = (-x)^2 - 3$  NO  
 x-axis:  $-y = x^2 - 3$  NO  
 y-axis:  $y = (-x)^2 - 3$  YES

8)  $y = x^3 + 2x - 4$

origin:  $-y = (-x)^3 + 2(-x) - 4$  NO  
 x-axis:  $-y = (x^3 + 2x - 4)$  NO  
 y-axis:  $-y = (-x)^3 + 2(-x) - 4$  NO

9) passes through  $(-2, -11)$  and perpendicular to the line passing through  $(1, 1)$  and  $(5, -1)$

$m = 2$   
 $m = \frac{-1-1}{5-1} = \frac{-2}{4} = -\frac{1}{2}$   
 $y = mx + b$   $y = 2x - 7$   
 $-11 = 2(-2) + b$   $b = -7$

10) passes through  $(0, 6)$  and parallel to the line  $2x + 3y + 4 = 0$

$m = -\frac{2}{3}$   
 $y = -\frac{2}{3}x + 6$

11) At the surface of the ocean, the water pressure is the same as the air pressure above the water, 15 lb/in. Below the surface the water pressure increases by 4.34 lb/in for every 10 feet of descent.

a. Find an equation for the relationship between pressure and depth below the ocean surface.

$P = .434d + 15$

b. What do the slope and y-intercept represent?

Slope is how much the pressure increases per foot of depth.

c. At what depth is the pressure 100 lb/in

$100 = 0.434d + 15$

$85 = 0.434d$

$d = 195.85ft$  y-int: is the initial pressure

12) If  $f(x) = x^2 - \sqrt{x+2} - 1$ , find:

a)  $f(0)$

$f(0) = 0 - \sqrt{0+2} - 1$

$f(0) = -\sqrt{2} - 1$

b)  $f(-1)$

$f(-1) = (-1)^2 - \sqrt{-1+2} - 1$

$f(-1) = -1$

a)  $f(a)$

$f(a) = a^2 + \sqrt{a+2} - 1$

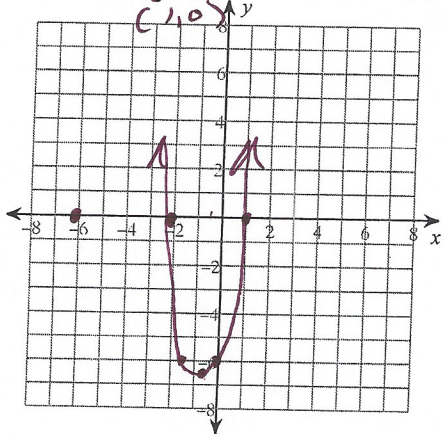
b)  $f(a-1)$

$f(a-1) = (a-1)^2 - \sqrt{a-1} - 1$

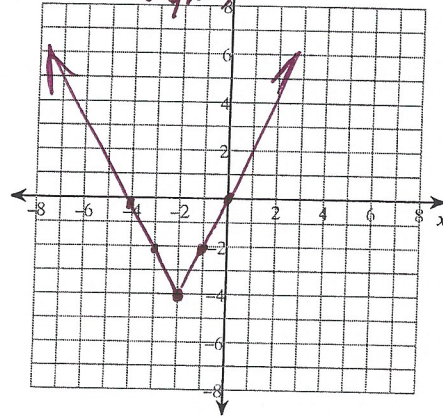
$f(a-1) = a^2 - 2a - \sqrt{a+1} - 1$

Sketch the graph of the following functions without using a calculator. Use a table of values, symmetry or identify several key points to help you. Find the x- and y-intercepts as well as the domain and the range

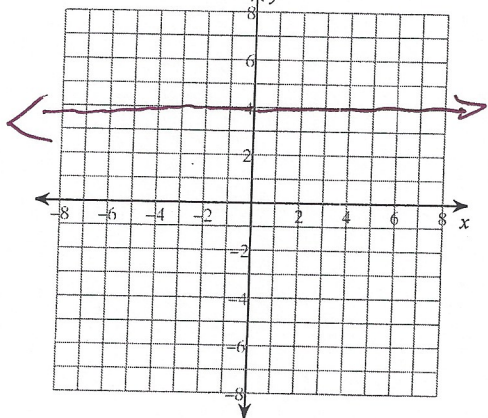
13)  $f(x) = 3x^2 + 3x - 6 = 3(x+2)(x-1)$   
 Domain:  $(-\infty, \infty)$  Range:  $(-\frac{27}{4}, \infty)$   
 x-intercept:  $(-2, 0)$  y-intercept:  $(0, -6)$   
 $(1, 0)$



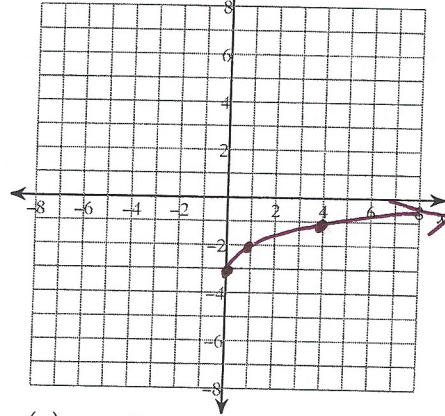
14)  $f(x) = 2|x+2| - 4$   
 Domain:  $(-\infty, \infty)$  Range:  $(-4, \infty)$   
 x-intercept:  $(-4, 0)$  y-intercept:  $(0, 0)$   
 $(-2, 0)$



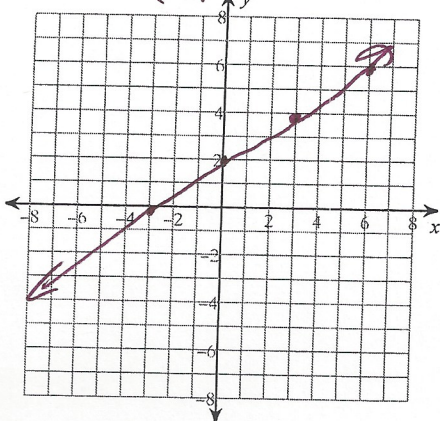
15)  $f(x) = 4$   
 Domain:  $(-\infty, \infty)$  Range:  $[4]$   
 x-intercept: none y-intercept:  $(0, 4)$



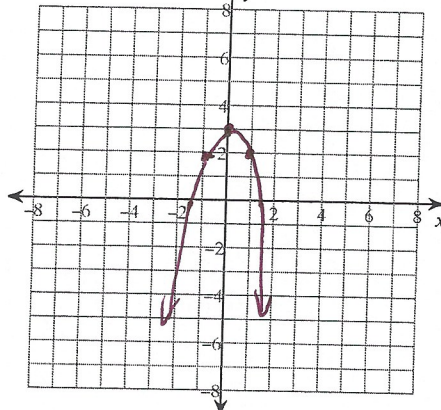
16)  $f(x) = \sqrt{x} - 3$   
 Domain:  $[0, \infty)$  Range:  $[-3, \infty)$   
 x-intercept:  $(9, 0)$  y-intercept:  $(0, -3)$



17)  $f(x) = \frac{2}{3}x + 2$   
 Domain:  $(-\infty, \infty)$  Range:  $(-\infty, \infty)$   
 x-intercept:  $(-3, 0)$  y-intercept:  $(0, 2)$



18)  $f(x) = -x^2 + 3$   
 Domain:  $(-\infty, \infty)$  Range:  $(-\infty, 3]$   
 x-intercept:  $(\pm\sqrt{3}, 0)$  y-intercept:  $(0, 3)$





Find the average rate of change of the function between the given points.

19)  $f(x) = |x + 1|$

$x = -5, x = 0$

$$\frac{f(0) - f(-5)}{0 - (-5)} = \frac{1 - 4}{5} = \boxed{\frac{-3}{5}}$$

20)  $f(x) = \frac{1}{x} + 8$

$x = -3, x = 6$

$$\begin{aligned} \frac{f(6) - f(-3)}{6 - (-3)} &= \frac{\frac{1}{6} + 8 - \left(\frac{1}{-3} + 8\right)}{9} \\ &= \frac{\frac{1}{6} - \frac{1}{3}}{9} \\ &= \frac{\frac{1}{6} - \frac{2}{6}}{9} \\ &= \frac{\frac{-1}{6}}{9} \\ &= \frac{-1}{54} \end{aligned}$$

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

$x = 6, x = 10$

$$\frac{f(10) - f(6)}{10 - 6} = \frac{3\sqrt{5} - 3}{4}$$

Write a function  $f(x)$  that has the following transformations:

22) Shifted right 3 units, down 4 units, and stretched by a factor of 3

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

23) Shifted left 1 unit, up 7 units, and stretched by a factor of  $\frac{1}{2}$

$$\frac{1}{2}f(x+1) + 7$$

24) Reflected in the x-axis and shifted down 2.

$$-f(x) - 2$$

25) Reflected in the y-axis and stretched by a factor of 9.

$$9f(-x)$$

Show Algebraically how to determine whether  $f(x)$  is even, odd, or neither.

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

$$\begin{aligned} f(-x) &= (-x)^2 - (-x) + 3 \\ &= x^2 + x + 3 \end{aligned}$$

$\boxed{\text{neither}}$

27)  $f(x) = \sqrt[3]{x} + x$

$$\begin{aligned} f(-x) &= \sqrt[3]{-x} + (-x) \\ &= -\sqrt[3]{x} - x \end{aligned}$$

$\boxed{\text{odd}}$

28)  $f(x) = -2$

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

$\boxed{\text{even}}$

29)  $f(x) = x^{-3} + x - 1$

$$\begin{aligned} f(-x) &= (-x)^{-3} + (-x) - 1 \\ &= -x^{-3} - x - 1 \end{aligned}$$

$\boxed{\text{neither}}$

30)  $f(x) = 2x^2 - x^6$

$$\begin{aligned} f(-x) &= 2(-x)^2 - (-x)^6 \\ &= 2x^2 - x^6 \end{aligned}$$

$\boxed{\text{even}}$

31)  $f(x) = \sqrt[5]{x}$

$$\begin{aligned} f(-x) &= \sqrt[5]{-x} \\ &= -\sqrt[5]{x} \end{aligned}$$

$\boxed{\text{odd}}$

Complete the square to write the quadratic function in standard (vertex) form. Identify the vertex and find the maximum or minimum value of each function.

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

$$-(x^2 + 2x + 1) + 5 + 1$$

$$f(x) = -(x+1)^2 + 6$$

Standard Form:  $f(x) = -(x+1)^2 + 6$

Vertex:  $(-1, 6)$

Max or Min:  $\frac{\text{max value } 6}{\text{when } x = -1}$

33)  $f(x) = 2x^2 - 6x + 1$

$$2(x^2 - 3x + \frac{9}{4}) + 1 - \frac{9}{2}$$

$$2(x - \frac{3}{2})^2 - \frac{7}{2}$$

Standard Form:  $f(x) = 2(x - \frac{3}{2})^2 - \frac{7}{2}$

Vertex:  $(\frac{3}{2}, -\frac{7}{2})$

Max or Min:  $\frac{\text{min value } -\frac{7}{2}}{\text{when } x = \frac{3}{2}}$

34)  $f(x) = 2x^2 + 5x - 4$

$$2(x^2 + \frac{5}{2}x + \frac{25}{16}) - 4 - \frac{25}{8}$$

$$2(x + \frac{5}{4})^2 - \frac{57}{8}$$

Standard Form:  $f(x) = 2(x + \frac{5}{4})^2 - \frac{57}{8}$

Vertex:  $(-\frac{5}{4}, -\frac{57}{8})$

Max or Min:  $\frac{\text{min value } -\frac{57}{8}}{\text{when } x = -\frac{5}{4}}$

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

$$-3(x^2 - \frac{4}{3}x + \frac{4}{9}) + 2 + \frac{4}{3}$$

$$-3(x - \frac{2}{3})^2 + \frac{10}{3}$$

Standard Form:  $f(x) = -3(x - \frac{2}{3})^2 + \frac{10}{3}$

Vertex:  $(\frac{2}{3}, \frac{10}{3})$

Max or Min:  $\frac{\text{max value } \frac{10}{3}}{\text{when } x = \frac{2}{3}}$

Combine the functions if  $f(x) = 2 + x$   $g(x) = \frac{1}{x}$ . Identify the Domain

36)  $f(x) + 2g(x)$

$$2+x + 2\left(\frac{1}{x}\right) \quad D: (-\infty, 0) \cup (0, \infty)$$

$$2+x + \frac{2}{x}$$

37)  $f(x) \cdot g(x)$

$$(2+x)\left(\frac{1}{x}\right)$$

$$\frac{2+x}{x} \quad D: (-\infty, 0) \cup (0, \infty)$$

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

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

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

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

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

$$D: (-\infty, -2) \cup (-2, \infty)$$

40)  $\left(\frac{f}{g}\right)(x)$

$$\frac{2+x}{1/x} = 2x+x^2$$

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

41)  $\left(\frac{g}{f}\right)(x)$

$$\frac{1/x}{2+x} = \frac{1}{x(2+x)}$$

$$D: (-\infty, -2) \cup (-2, 0) \cup (0, \infty)$$

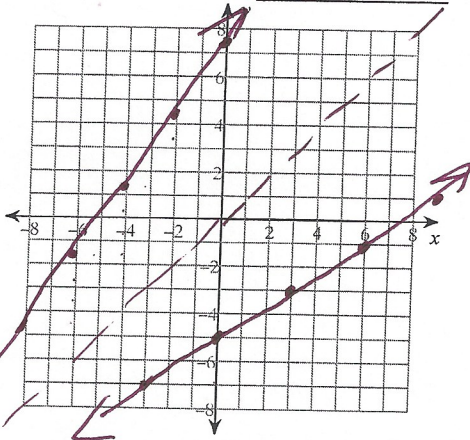
Find the inverse of each function (if one exists). State the domains of the original function and its inverse. Then sketch both functions.

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

Domain of  $f(x)$ :  $(-\infty, \infty)$

$f^{-1}(x) = \frac{3}{2}(x+5)$  or  $\frac{3}{2}x + \frac{15}{2}$

Domain of  $f^{-1}(x)$ :  $(-\infty, \infty)$

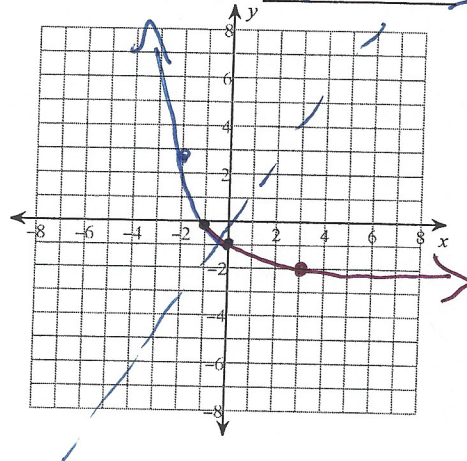


43)  $f(x) = -\sqrt{x+1}$

Domain of  $f(x)$ :  $[-1, \infty)$

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

Domain of  $f^{-1}(x)$ :  $(-\infty, 0]$

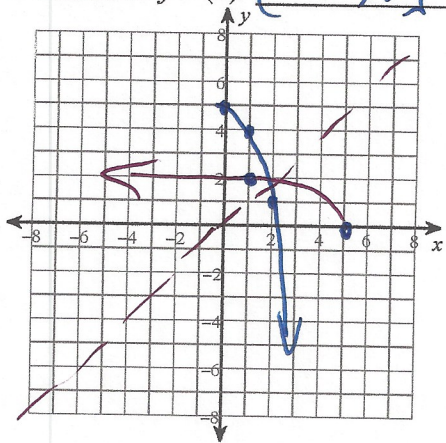


44)  $f(x) = 5 - x^2 \quad x \geq 0$

Domain of  $f(x)$ :  $[0, \infty)$

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

Domain of  $f^{-1}(x)$ :  $(-\infty, 5]$

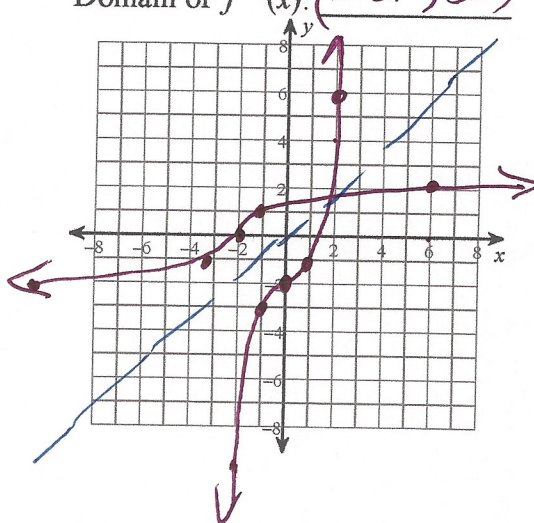


45)  $f(x) = x^3 - 2$

Domain of  $f(x)$ :  $(-\infty, \infty)$

$f^{-1}(x) = \sqrt[3]{x+2}$

Domain of  $f^{-1}(x)$ :  $(-\infty, \infty)$



Verify by composition that the two given functions are inverses of each other.

46)  $f(x) = 2x - 1$  and  $g(x) = \frac{x+1}{2}$

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

48) Show that  $f(x) = \frac{1}{x}$  is its own inverse.

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

47)  $f(x) = x^4 + 2$  and  $g(x) = \sqrt[4]{x-2}$

$g(f(x)) = g(x^4 + 2) = \sqrt[4]{x^4 + 2 - 2} = \sqrt[4]{x^4} = x$

49) A soft drink vendor at a popular beach analyzes his sales record, and finds that if he sales  $x$  cans of soda pop in one day, his profit (in dollars) can be modeled by the function:

$P(x) = -0.001x^2 + 3x - 1800$

$x = \frac{-3}{2(-.001)} = 1500$

max profit of \$450 per day when 1500 cans are sold

$P(1500) = 450$

What is the maximum profit per day, and how many cans must he sell for maximum profit?

50) For his services, a private investigator requires a \$500 retention fee plus \$80 per hour. Let  $x$  represent the number of hours the investigator spends working on a case.

A) Find a function  $f(x)$  that models the investigator's fee as a function of  $x$ .

$f(x) = 80x + 500$

B) Find  $f^{-1}(x)$ , what does  $f^{-1}(x)$  represent?

$f^{-1}(x) = \frac{x-500}{80}$

$f^{-1}(x)$  represents the number of hours he has to work to obtain a certain fee

C) Find  $f^{-1}(1220)$ . What does your answer represent?

$f^{-1}(1220) = \frac{1220-500}{80} = 9$  (he has to work 9 hrs)