

### 3-6 Solution Set

5. The graph of  $\frac{1}{x}$  is stretched vertically by 3 units and translated down 4 units.
7. The graph of  $\frac{1}{x}$  is stretched vertically by 2 units, reflected along the  $x$  axis, and translated vertically up by 3 units.
9. The graph of  $\frac{1}{x^2}$  is stretched vertically by 9 units and translated vertically up by 1.

$$11. \frac{1}{x+2} + \frac{3}{x-1} = \frac{2x+9}{x^2+x-2} = \frac{2x+9}{(x+2)(x-1)}$$

$$\begin{aligned} (x+2)(x-1): (x-1)+3(x+2) &= 2x+9 \\ \Rightarrow x-1+3x+6 &= 2x+9 \\ \Rightarrow 2x &= 4 \\ \Rightarrow x &= 2 \end{aligned}$$

13.  $x = -4$

15.  $x \cong 3.34$

17.  $x > -5$

19. a. When  $g = 0$ ,  $h_{\max} = 1000$  hundred gallons =  $10^5$  gallons

When  $h = 0$ ,  $g_{\max} = 5000 \times 10^2$  gallons =  $5 \times 10^5$  gallons

b. When  $r = 0$ ,  $b_{\max} = 10000$

When  $b = 0$ ,  $r_{\max} = 30000$

c. Yes

21. a.  $600t$  gram

b.  $\frac{600t}{15t+100}$  gram/liter

c.



d. Over a long period of time, the concentration levels settle to 40 grams/liter.

23. There is no horizontal asymptote.  $f(x)$  has a minimum value of 289 at  $x = 63$ . (ie surveying 63 people at a cost of \$289 is most economical).

25. a.  $n(t) = -0.022x^3 + 0.740x^x - 5.24x + 18.622$

$$a(t) = -0.0248x^3 + 0.806x^2 - 4.55x + 35.388$$

b. *iv.*  $\frac{n(t)}{a(t)} \cdot 100$

c.  $p(t) = 100 \cdot \frac{n(t)}{a(t)} = 100 \cdot \frac{-0.022x^3 + 0.740x^x - 5.24x + 18.622}{-0.0248x^3 + 0.806x^2 - 4.55x + 35.388}$

d.  $p(20) = 49.5$ .

So 49.5% of the total prisoners are non violent felons.

e. The value of  $p$  increases and decreases with time (ie the percent of nonviolent felons increases and decreases with time).

f. For  $t = 1$ ,  $t = 15$ , and  $t = 20$  (ie in 1979, 1993, and 1998), half the prisoners in NY were nonviolent prisoners.

g. Based on the model, when  $t = 25.6$  (ie 2003), 0% of the prisoners are nonviolent prisoners which is absurd.

h. After 1998, Governor Pataki placed new measures to parole nonviolent felons.

27.  $x - 3 = \frac{2}{x} - \frac{6}{x^2}$

$$x^2: x^3 - 3x^2 = 2x - 6$$

$$\Rightarrow x^3 - 3x^2 - 2x + 6 = 0$$

$$\Rightarrow x^2(x - 3) - 2(x - 3) = 0$$

$$\Rightarrow (x^2 - 2)(x - 3) = 0$$

$$\Rightarrow x = \pm\sqrt{2}, 3$$

29.  $x = 1,5$

31. The graph of parabola  $x^2$  is stretched vertically by a factor of 2 and translated 1 unit to the right.

33. The graph of  $g(x) = x^2$  is translated 1 unit to the left and 6 units vertically up.

35. The graph of  $\sqrt{x}$  translated 2 units to the right and vertically up 3 units.

37. The graph of  $\sqrt{x}$  is stretched vertically 2 units and translated 5 units vertically down.

39. The graph of  $\frac{1}{x}$  is stretched vertically 2 units, reflected along the  $x$  axis, and translated 3 units up.

41. The graph of  $x^2$  is translated 3 units to the left and down 9 units.

$$43. \{x \geq 2.225\} \cup \{x \leq -2.401\}$$

$$45. x = -1.078, 9,970$$

$$47. x = 2.732$$

$$49. x < -0.365$$

51. Statement

$$y = \frac{a}{x+b}$$

$$y(x+b) = a$$

$$xy + yb = a$$

$$yb = -xy + a$$

$$y = -\frac{xy}{b} + \frac{a}{b}$$

Reason

Replace  $r(x)$  with  $y$  to simplify notation

Multiplicative Inverse Property to have both sides with positive exponents

Distributive Property to set up  $b$  to be on one side

Additive Inverse Property to get  $yb$  alone

Multiplicative Inverse Property to get  $y$  alone

53.

$$55. \frac{x-a}{b-x} = 1$$

$$\Rightarrow x - a = b - x$$

$$\Rightarrow x + x = b + a$$

$$\Rightarrow 2x = a + b$$

$$\Rightarrow x = \frac{a+b}{2}$$

$$57. x = \frac{2ab}{a+b}$$