SECTION 2.1

#12

$g(x) = 4x - 3$

a) $g(0) = 4(0) - 3 = -3$

b) $g(-5) = 4(-5) - 3 = -23$

c) $g\left(\frac{3}{4}\right) = \cancel{4}\left(\frac{3}{\cancel{4}}\right) - 3$

$= 3 - 3 = 0$

d) $g(5b) = 4(5b) - 3 = 20b - 3$

e) $g(b+5) = 4(b+5) - 3$

$= 4b + 20 - 3 = 4b + 17$

#18

$f(x) = \frac{3x-1}{x-5}$

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

b) $f(3) = \frac{3(3)-1}{3-5} = -\frac{8}{2} = -4$

c) $f(-3) = \frac{3(-3)-1}{-3-5} = \frac{10}{8} = \frac{5}{4}$

d) $f(10) = \frac{3(10)-1}{10-5} = \frac{29}{5}$

e) $f(a+h) = \frac{3(a+h)-1}{(a+h)-5}$

$= \frac{3a+3h-1}{a+h-5}$

f) Denominator would be zero.

#24

The graph of g is the graph of f shifted down by 2 units.

#40

$f(-4) = 4$ because when $x = -4, y = 4$

#46

$g(10) = -2$ because when $x = 10, y = -2$

#52

Domain = $\{x \mid x \geq -1\} = [-1, \infty)$

Range = $\{y \mid y \geq 0\} = [0, \infty)$

#58

Domain = $\{x \mid x = -5, -2, 0, 1, 4\}$

Range = $\{y \mid y = -2\}$

#60

$f(x) = x^2 - x + 4$, $g(x) = 3x - 5$

$g(-1) = 3(-1) - 5 = -8$

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

$= (-8)^2 - (-8) + 4 = 64 + 8 + 4 = 76$

#64

$f(x) = x^2 - 3x + 7$

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

$= \left((-x)^2 - 3(-x) + 7\right) - \left(x^2 - 3x + 7\right)$

$= \left(x^2 + 3x + 7\right) - \left(x^2 - 3x + 7\right)$

$= \cancel{x^2} + 3x + \cancel{7} - \cancel{x^2} + 3x - \cancel{7}$

$= 6x$

#66

a) $f(-3) = 6(-3) - 1 = -19$

because $x = -3$ and $-3 < 0$

b) $f(0) = 7(0) + 3 = 3$

because $x = 0$ and $0 \geq 0$

c) $f(4) = 7(4) + 3 = 31$

because $x = 4$ and $4 \geq 0$

d) $f(-100) + f(100) =$

$= (6(-100) - 1) + (7(100) + 3)$

$= (-600 - 1) + (700 + 3)$

$= -601 + 703 = 102$

#68

Domain = $\{x | x \in \mathbb{R}\} = (-\infty, \infty)$

Range = $\{y | y > 0\} = (0, \infty)$

SECTION 2.2

#4

$$g(x) = \frac{1}{x+5}$$

Condition: $x + 5 \neq 0$, $x \neq -5$

Domain = $\mathbb{R} \setminus \{-5\} = (-\infty, -5) \cup (-5, \infty)$

#10

$$f(x) = \frac{1}{x+8} + \frac{3}{x-10}$$

Conditions: $x + 8 \neq 0$ and $x - 10 \neq 0$

Therefore, $x \neq -8$ and $x \neq 10$

Domain = $\mathbb{R} \setminus \{-8, 10\}$

#50

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

$= 2 - 3 = -1$

because $(-2, 2) \in$ graph of g (when $x = -2, y = 2$)

and $(-2, 3) \in$ graph of f (when $x = -2, y = 3$)

#52

$$\left(\frac{g}{f}\right)(3) = \frac{g(3)}{f(3)} = \frac{0}{-3} = 0$$

because $(3, 0) \in$ graph of g (when $x = 3, y = 0$)

and $(3, -3) \in$ graph of f (when $x = 3, y = -3$)

SECTION 2.3

#24

$$m = \frac{\Delta y}{\Delta x} = \frac{-6 - \frac{1}{6}}{\frac{3}{2} - \frac{3}{2}} = \frac{-6 - \frac{1}{6}}{0}$$

undefined slope ; vertical line

#59

$$m = \frac{\Delta y}{\Delta x} = \frac{a - 0}{0 - b} = -\frac{a}{b}$$; descending line

#62

$$m = \frac{\Delta y}{\Delta x} = \frac{(a + c) - c}{a - (a - b)}$$

$$= \frac{a + \cancel{c} - \cancel{c}}{\cancel{a} - \cancel{a} + b} = \frac{a}{b}$$; ascending line

#65

$$m = \frac{\Delta y}{\Delta x} = \frac{y - 4}{3 - 1} = \frac{y - 4}{2}$$

On the other hand, $m = -3$. Therefore,

$$\frac{y - 4}{2} = -3$$

$y - 4 = -6$, so $y = -2$.

#74
$m = 2$
The slope shows that the average cost of a retail drug prescription has increased at a rate of $2 per year since 1991.

#76
m = - 0.7
The slope shows that the percentage of U.S. adults who read a newspaper has decreased at a rate of 0.7% per year since 1995.

#82

$I(x) = 21x + 84$

where x represents the number of years after 1998 and $I(x)$ represents the number of U.S. Internet users (in millions).

SECTION 2.4

#50
We need an equation of the line that passes through $(-2,-7)$ and is parallel to $y = -5x + 3$.
For that, we need a point (given) and the slope.
We also know that two lines are parallel if and Only if they have the same slope.

Therefore, we need to find the slope of the given line $y = -5x + 3$: $m = -5$
Therefore, the slope of the line we are interested in is also $m = -5$.

$y - y_1 = m(x - x_1)$ with $(-2,-7)$ and $m = -5$
$y - (-7) = -5(x - (-2))$
$y + 7 = -5(x + 2)$ - point-slope form
$y + 7 = -5x - 10$
$y = -5x - 17$ - slope – intercept form

#56
We need an equation of the line that passes through $(5,-9)$ and is perpendicular to the line $x + 7y - 12 = 0$.
For that, we need a point (given) and the slope. We also know that two lines are perpendicular if and only if their slopes are negative reciprocals of each other.

First, we find the slope of the given line $x + 7y - 12 = 0$. For that, we solve the equation for y.
$7y = -x + 12$
$y = -\frac{1}{7}x + \frac{12}{7}$
$m = -\frac{1}{7}$
Therefore, the slope of the line perpendicular to this one is $m_{\perp} = 7$.
$y - y_1 = m(x - x_1)$ with $(5,-9)$ and $m = 7$
$y - (-9) = 7(x - 5)$
$y + 9 = 7(x - 5)$ - point – slope form
$y + 9 = 7x - 35$
$y = 7x - 44$ - slope – intercept form

M71

HOMEWORK # 2

SECTION 2.1

(65) $f(x) = \begin{cases} 3x+5 & \text{if } x<0 \\ 4x+7 & \text{if } x \geq 0 \end{cases}$

a) $f(-2) = 3(-2)+5 = -1$
$x=-2<0$ $\quad f(-2)=-1$

b) $f(0) = 4(0)+7 = 7$
$x=0 \geq 0$ $\quad f(0)=7$

c) $f(3) = 4(3)+7 = 19$
$x=3 \geq 0$ $\quad f(3)=19$

d) $f(-100)+f(100) =$
$= (3(-100)+5) + (4(100)+7)$
$= -300+5+400+7 = 112$
$f(-100)+f(100)=112$

(66) $f(x) = \begin{cases} 6x-1 & \text{if } x<0 \\ 7x+3 & \text{if } x \geq 0 \end{cases}$

a) $f(-3) = 6(-3)-1 = -19$
$x=-3<0$ $\quad f(-3)=-19$

b) $f(0) = 7(0)+3 = 3$
$x=0 \geq 0$ $\quad f(0)=3$

c) $f(4) = 7(4)+3 = 31$
$x=4 \geq 0$ $\quad f(4)=31$

d) $f(-100)+f(100) =$
$= (6(-100)-1) + (7(100)+3)$
$= -600-1+700+3 = 102$
$f(-100)+f(100)=102$

SECTION 2.2

(4) $g(x) = \dfrac{1}{x+5}$

condition: $x+5 \neq 0$
$x \neq -5$

Domain $= \mathbb{R} \setminus \{-5\}$

OR

Domain $= \{x \mid x \in \mathbb{R}, x \neq -5\}$

(10) $f(x) = \dfrac{1}{x+8} + \dfrac{3}{x-10}$

conditions: $\begin{cases} x+8 \neq 0 \\ \text{and} \\ x-10 \neq 0 \end{cases} \iff \begin{cases} x \neq -8 \\ x \neq 10 \end{cases}$

Domain $= \mathbb{R} \setminus \{-8, 10\}$

OR

Domain $= \{x \mid x \in \mathbb{R}, x \neq -8, x \neq 10\}$

(69) $C(x) = 600{,}000 + 45x$
$R(x) = 65x$
x = # of radios produced and sold
$C(x)$ = cost of producing x radios
$R(x)$ = revenue when selling x radios

First, calculate
$(R-C)(x) = R(x) - C(x)$
$= 65x - (600{,}000 + 45x)$
$= 65x - 600{,}000 - 45x$
$(R-C)(x) = 20x - 600{,}000$

a) $(R-C)(20{,}000) = 20(20{,}000) - 600{,}000$
$= -200{,}000$

if the company produces and sells 20,000 radios, it will lose \$200,000

$$(R-C)(30{,}000) = 20(30{,}000) - 600{,}000$$
$$= 0 \$$$

if the company produces and sells 30,000 radios, it will break even with its costs equal to its revenue

$$(R-C)(40{,}000) = 20(40{,}000) - 600{,}000$$
$$= 200{,}000 \$$$

if the company produces and sells 40,000 radios it will make a profit of \$200,000.