44. Write $Ax+By+C=0$ in slope-intercept form.

$$Ax+By+C=0$$
$$By=-Ax-C$$
$$\frac{By}{B}=\frac{-Ax}{B}-\frac{C}{B}$$
$$y=-\frac{A}{B}x-\frac{C}{B}$$

The slope of the given line is $-\frac{A}{B}$.

The slope of any line perpendicular to $Ax+By+C=0$ is $\frac{B}{A}$.

45. The slope of the line containing $(1,-3)$ and $(-2,4)$ has slope

$$m=\frac{4-(-3)}{-2-1}=\frac{4+3}{-3}=\frac{7}{-3}=-\frac{7}{3}.$$

Solve $Ax+y-2=0$ for y to obtain slope-intercept form.

$$Ax+y-2=0$$
$$y=-Ax+2$$

So the slope of this line is $-A$.

This line is perpendicular to the line above so its slope is $\frac{3}{7}$. Therefore, $-A=\frac{3}{7}$ so $A=-\frac{3}{7}$.

Mid-Chapter 2 Check Point

1. The relation is not a function.
The domain is $\{1,2\}$.
The range is $\{-6,4,6\}$.

2. The relation is a function.
The domain is $\{0,2,3\}$.
The range is $\{1,4\}$.

3. The relation is a function.
The domain is $\{x\mid -2\le x<2\}$.
The range is $\{y\mid 0\le y\le 3\}$.

4. The relation is not a function.
The domain is $\{x\mid -3<x\le 4\}$.
The range is $\{y\mid -1\le y\le 2\}$.

5. The relation is not a function.
The domain is $\{-2,-1,0,1,2\}$.
The range is $\{-2,-1,1,3\}$.

6. The relation is a function.
The domain is $\{x\mid x\le 1\}$.
The range is $\{y\mid y\ge -1\}$.

7. $x^2+y=5$
$$y=-x^2+5$$
For each value of x, there is one and only one value for y, so the equation defines y as a function of x.

8. $x+y^2=5$
$$y^2=5-x$$
$$y=\pm\sqrt{5-x}$$
Since there are values of x that give more than one value for y (for example, if $x=4$, then $y=\pm\sqrt{5-4}=\pm 1$), the equation does not define y as a function of x.

9. Each value of x corresponds to exactly one value of y.

10. Domain: $(-\infty,\infty)$

11. Range: $(-\infty,4]$

12. x-intercepts: -6 and 2

13. y-intercept: 3

14. increasing: $(-\infty, -2)$

15. decreasing: $(-2, \infty)$

16. $x = -2$

17. $f(-2) = 4$

18. $f(-4) = 3$

19. $f(-7) = -2$ and $f(3) = -2$

20. $f(-6) = 0$ and $f(2) = 0$

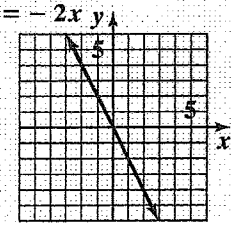
21. $(-6, 2)$

22. $f(100)$ is negative.

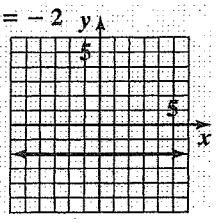
23. neither; $f(-x) \neq x$ and $f(-x) \neq -x$

24. $\dfrac{f(x_2) - f(x_1)}{x_2 - x_1} = \dfrac{f(4) - f(-4)}{4 - (-4)} = \dfrac{-5 - 3}{4 + 4} = -1$

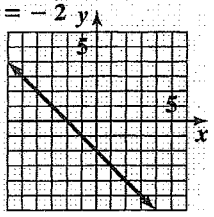
25. $y = -2x$



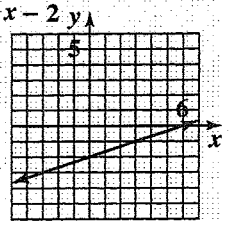
26. $y = -2$



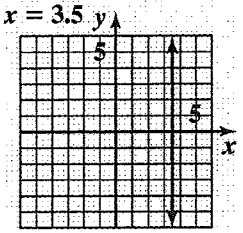
27. $x + y = -2$



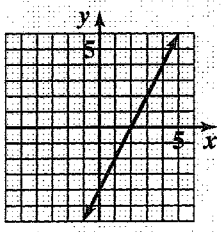
28. $y = \dfrac{1}{3}x - 2$



29. $x = 3.5$

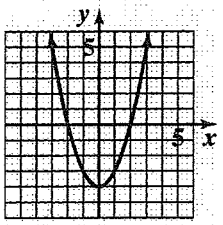


30.



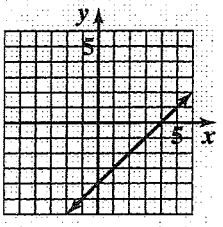
$4x - 2y = 8$

31.



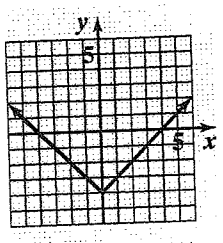
$f(x) = x^2 - 4$

32.



$f(x) = x - 4$

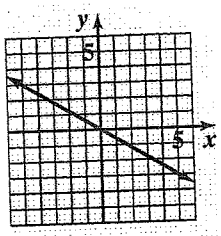
33.



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

34. $5y = -3x$

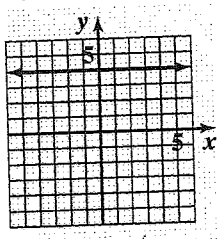
$y = -\frac{3}{5}x$



$5y = -3x$

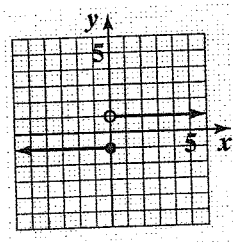
35. $5y = 20$

$y = 4$



$5y = 20$

36.



$f(x) = \begin{cases} -1 \text{ if } x \le 0 \\ 1 \text{ if } x > 0 \end{cases}$

37. a. $f(-x) = -2(-x)^2 - x - 5 = -2x^2 - x - 5$

neither; $f(-x) \neq x$ and $f(-x) \neq -x$

b. $\dfrac{f(x+h) - f(x)}{h}$

$= \dfrac{-2(x+h)^2 + (x+h) - 5 - (-2x^2 + x - 5)}{h}$

$= \dfrac{-2x^2 - 4xh - 2h^2 + x + h - 5 + 2x^2 - x + 5}{h}$

$= \dfrac{-4xh - 2h^2 + h}{h}$

$= \dfrac{h(-4x - 2h + 1)}{h}$

$= -4x - 2h + 1$

38. $C(x) = \begin{cases} 30 & \text{if } 0 \le t \le 200 \\ 30 + 0.40(t - 200) & \text{if } t > 200 \end{cases}$

a. $C(150) = 30$

b. $C(250) = 30 + 0.40(250 - 200) = 50$

39. $y - y_1 = m(x - x_1)$

$y - 3 = -2(x - (-4))$

$y - 3 = -2(x + 4)$

$y - 3 = -2x - 8$

$y = -2x - 5$

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

40. $m = \dfrac{\text{Change in } y}{\text{Change in } x} = \dfrac{1 - (-5)}{2 - (-1)} = \dfrac{6}{3} = 2$

$y - y_1 = m(x - x_1)$

$y - 1 = 2(x - 2)$

$y - 1 = 2x - 4$

$y = 2x - 3$

$f(x) = 2x - 3$

41. $3x-y-5=0$

$-y=-3x+5$

$y=3x-5$

The slope of the given line is 3, and the lines parallel, so $m=3$.

$y-y_1=m(x-x_1)$

$y-(-4)=3(x-3)$

$y+4=3x-9$

$y=3x-13$

$f(x)=3x-13$

42. $2x-5y-10=0$

$-5y=-2x+10$

$\frac{-5y}{-5}=\frac{-2x}{-5}+\frac{10}{-5}$

$y=\frac{2}{5}x-2$

The slope of the given line is $\frac{2}{5}$, and the lines are perpendicular, so $m=-\frac{5}{2}$.

$y-y_1=m(x-x_1)$

$y-(-3)=-\frac{5}{2}\left(x-(-4)\right)$

$y+3=-\frac{5}{2}x-10$

$y=-\frac{5}{2}x-13$

$f(x)=-\frac{5}{2}x-13$

43. $m_1=\frac{\text{Change in } y}{\text{Change in } x}=\frac{0-(-4)}{7-2}=\frac{4}{5}$

$m_2=\frac{\text{Change in } y}{\text{Change in } x}=\frac{6-2}{1-(-4)}=\frac{4}{5}$

The slope of the lines are equal thus the lines are parallel.

44. The slope indicates that the percentage of U.S. colleges offering distance learning is increasing by 7.8% each year.

45. $\frac{f(x_2)-f(x_1)}{x_2-x_1}=\frac{f(2)-f(-1)}{2-(-1)}$

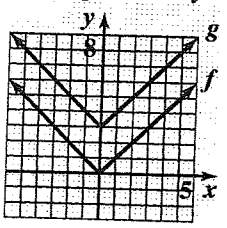
$=\frac{\left(3(2)^2-2\right)-\left(3(-1)^2-(-1)\right)}{2+1}$

$=2$

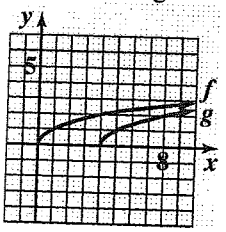
Section 2.5

Check Point Exercises

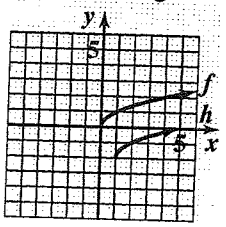
1. Shift up vertically 3 units.



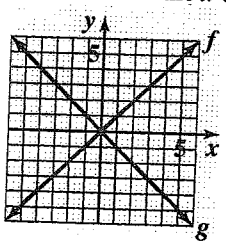
2. Shift to the right 4 units.



3. Shift to the right 1 unit and down 2 units.



4. Reflect about the x-axis.



5. Reflect about the y-axis.