SECTION 2.1
Graphing linear equations

Graph the following linear equations using at least 3 points.
1. \(2x - 3y = 7\)
2. \(10x + 2y - 9 = 0\)
3. \(-3x - 5y = 10\)
4. \(4x + 3y = 12\)
5. \(-5x + 7y = 9\)
6. \(\frac{1}{2}x - 2y = 5\)
7. \(x + \frac{2}{3}y = 9\)
8. \(\frac{1}{2}x - 4y = 2\)
9. \(0.4x - 0.2y = 1\)
10. \(-1.2y - 2.4x = 3\)

SECTION 2.1
Graphing linear equations using intercepts

Graph the following linear equations using the x- and y- intercepts.
1. \(2x - 3y = 6\)
2. \(3y - 5x = 10\)
3. \(-x + 4y - 8 = 0\)
4. \(2x - 5y = 7\)
5. \(9 = 6x - y\)
6. \(\frac{1}{2}x - y = 2\)
7. \(2x + \frac{1}{3}y + 3 = 0\)
8. \(\frac{2}{3}x - \frac{1}{4}y = 2\)
9. \(-0.5x - 0.3y - 1.2 = 0\)
10. \(3.2x - y = 1.6\)

SECTION 2.2
Slope

Determine the slope of the line passing through the two points.
1. \((-3, 2)\) and \((5, -5)\)
2. \((6, 1)\) and \((3, -2)\)
3. \((1, -\frac{1}{3})\) and \((2\frac{1}{2}, -3)\)
4. \((\frac{1}{2}, 4)\) and \((3, -\frac{1}{4})\)
5. \((0.5, 1.75)\) and \((-0.25, 3.5)\)
6. \((1.6, -2.3)\) and \((-5.2, 6.2)\)

7. Determine the slope of the lines graphed below.
   a. [Graph]
   b. [Graph]
   c. [Graph]
   d. [Graph]
Determine the slope of the line with the equation below using 2 points on the line.

8. \(-2x + 4y = 6\)
9. \(3x - 2y - 4 = 0\)
10. \(\frac{1}{2}y + 3x = 10\)

Draw a line through the given point having the given slope:

11. \((-2, -4)\) and \(m = 1\)
12. \((0, 3)\) and \(m = -\frac{3}{4}\)
13. \((-\frac{1}{2}, 4)\) and \(m = -\frac{1}{3}\)
14. \((-3, -2)\) and \(m = 4\)

Match the graph of the lines with the slopes.

15. \(m = -3\)
16. \(m = -\frac{1}{2}\)
17. \(m = 0\)
18. \(m = 1\)
19. \(m = 4\)
20. \(m = \text{undefined}\)

a.
b.

c.

d.
21. Use slope to determine if the points (1, 0), (2, 1) and (−5, −4) are on the same line (collinear).

22. Use slope to determine if the points (−1, 3), (0, 6) and (−3, −3) are on the same line.
23. The value of a laptop decreases with time. If a laptop cost $1300 in 2004 and sells used in 2008 for $700, what was the rate of depreciation of the laptop with respect to time in years?

24. The $y$-coordinate of a line decreases by 3 for each time the $x$-coordinate increases by 2. If $(3, -2)$ is a point on this line what point is on the line when $x$ increases by 6?

SECTION 2.2
Horizontal and Vertical lines
1. Write an equation of the horizontal line through the point $(-3, 4)$.
2. Write an equation of the vertical line through the point $(-5, \frac{1}{3})$.
3. Write an equation of the line through the point $(8, \sqrt{2})$ which is parallel to the $x$-axis.
4. Write an equation of the line through the point $(-12, 6)$ which is perpendicular to the $y$-axis.
5. What are the equations of the $x$- and $y$-axes?
6. Write equations for lines parallel to $x = -5$ which are 6 units away?

SECTION 2.3
The Point Slope Form of a Line
1. Determine the equation of the line that has slope $\frac{1}{2}$ and passes through the point $(-3, 5)$ in the form $y =$
2. Determine the equation of the line that has slope 4 and passes through the point $(6, 10)$ in the form $y =$
3. Determine the equation of the line that has slope $\frac{2}{3}$ and passes through the point $(-1, -1)$ in the form $y =$
4. Determine the equation of the line that has slope $\sqrt{2}$ and passes through the point $(-\sqrt{2}, 5)$ in the form $y =$
5. Determine the equation of the line that passes through the points $(-2, -1)$ and $(3, -4)$ in the form $y =$
6. Determine the equation of the line that passes through the points $(5, 0)$ and $(-\frac{1}{2}, 3)$ in the form $y =$
7. Determine the equation of the line that passes through the points $(0.2, -2.4)$ and $(-3.2, 4.4)$ in the form $y =$
8. Determine the equation of the line that crosses the $x$-axis at $-6$ and the $y$-axis at $2 \frac{2}{3}$ in the form $y =$
9. A classroom is normally 70°C. The temperature rises one-fifth of a degree for every student in the room.
   a) Write a linear equation to represent the temperature ($y$) of the room in terms of the number of students ($x$) present in the classroom.
b) How many students would be in the classroom if the temperature is 76°F.

10. The grass is 2 1/4 inches 6 days after the last mowing. It is 3 1/2 inches 12 days after the last mowing.
   a) Write a linear equation to represent the height of the grass \( y \) in terms of the number of days \( x \) after the last mowing.
   b) How tall will the grass be if the lawn is not mown for a month (30 days)?

SECTION 2.4
Writing equations and determine the slope given an equation.

1. Write the equation of the line with slope \(-\frac{2}{3}\) and \(y\)-intercept \((0, \frac{3}{2})\) in slope-intercept form.
2. Write the equation of the line with slope \(-0.8\) which crosses the \(y\)-intercept at \((-3.7\) in the form \(y =
3. Write the equation in slope-intercept form of the horizontal line with \(y\)-intercept \((0, -7)\).
4. Write the equation of the vertical line with \(y\)-intercept \((0, -1.5)\).
5. Determine the slope and \(y\)-intercept of the graph of \(12x - 14y + 30 = 0\).
6. Determine the slope and \(y\)-intercept of the graph of \(-6x - 3y = 8\).
7. What is the slope of the line with equation \(\frac{1}{2}x - 5y - 7 = 0\)?
8. What is the slope of the line with equation \(2.1x + 3.6y = 8.2\)?

SECTION 2.4
The General and Slope Intercept Forms
1. Write the equation \(y = -3x + 7\) in general form.
2. Write the equation \(y = \frac{3}{4}x - \frac{1}{2}\) in general form.
3. Write the equation \(\frac{1}{3}y - \frac{2}{5}x - 3 = 0\) in general form.
4. Write the equation \(y = 3.3x - 7.5\) in general form.

SECTION 2.4.
Graph Linear Functions
1. Graph the linear function \(f(x) = -4x + 2.5\)
2. Graph the linear function \(g(x) = \frac{2}{3}x - 2\)
3. Graph the linear function \(h(x) = x - \sqrt{2}\)
4. Graph the linear function \( i(x) = -\frac{1}{4}x + 1 \)

SECTION 2.4
Parallel and Perpendicular lines

Determine whether the lines \( \ell_1 \) and \( \ell_2 \) through the pairs of points are parallel, perpendicular, or neither.

1. \( \ell_1: (-2, 5) \) and \((-4, 9)\)
   \( \ell_2: (4, -1) \) and \((3, 1)\)

2. \( \ell_1: (5, 6) \) and \((4, 3)\)
   \( \ell_2: (-5, -2) \) and \((4, 1)\)

3. \( \ell_1: (2, -2) \) and \((5, 2)\)
   \( \ell_2: (-2, 7) \) and \((6, 1)\)

4. \( \ell_1: (5, 0) \) and \((-5, 2)\)
   \( \ell_2: (-2, -4) \) and \((3, -3)\)

Determine whether the lines with equations below are parallel, perpendicular, or neither.

5. \(-4x + 7y + 8 = 0\) and \(5x + 8y = 10\)

6. \(2x + 3y = 3\) and \(3x - 2y = 4\)

7. \(\frac{4}{5}x - 2y = \frac{2}{5}\) and \(x - 5y = 10\)

8. \(4.5x - 3y = 6.8\) and \(\frac{3}{2}x + y = \frac{1}{6}\)

9. Determine the equation of a line which passes through the point \(6, -2\) which is parallel to the line \(5x - 3y = 15\).

10. Determine the equation of a line which passes through the point \((-4, \frac{1}{2})\) which is perpendicular to the line \(4x = 12 - 3y\).

11. Determine the equation of a line which is perpendicular to the line \(-2x - 4y + 6 = 0\) and has the same y-intercept.

12. Determine the equation of a line which is parallel to the line \(6.4x + 2.4y = 8.5\) which crosses the x-axis at \(-1.8\).

13. Determine whether the quadrilateral with vertices \((-2, 3), (4, 2), (-3, -1),\) and \((3, -3)\) is a
14. Determine whether the quadrilateral with vertices \((-4,-1), (4,3), (-1,-4),\) and \((3,-2)\) is a trapezoid.

15. Determine whether the triangle with vertices \((-2,3), (1,-4),\) and \((7,-1)\) is a right triangle.

16. Show that the diagonals of the square with vertices \((-a,a), (-a,-a), (a,a),\) and \((a,-a)\) are perpendicular.
1. \(2x - 3y = 7\), Solution is: \(y = \frac{2}{3}x - \frac{7}{3}\)

2. \(10x + 2y - 9 = 0\), Solution is: \(y = -5x + \frac{9}{2}\)

3. \(-3x - 5y = 10\), Solution is: \(y = -\frac{3}{5}x - 2\)

4. \(4x + 3y = 12\), Solution is: \(y = -\frac{4}{3}x + 4\)
5. \(-5x + 7y = 9\), Solution is: \(y = \frac{5}{7}x + \frac{9}{7}\)

6. \(\frac{1}{2}x - 2y = 5\), Solution is: \(y = \frac{1}{4}x - \frac{5}{2}\)

7. \(x + \frac{2}{3}y = 9\), Solution is: \(y = -\frac{3}{2}x + \frac{27}{2}\)
8. $\frac{1}{3}x - 4y = 2$, Solution is: $\{y = \frac{1}{12}x - \frac{1}{2}\}$

9. $0.4x - 0.2y = 1$, Solution is: $\{y = 2.0x - 5.0\}$

10. $-1.2y - 2.4x = 3$, Solution is: $\{y = -2.0x - 2.5\}$
SECTION 2.1
ANSWERS — Graphing linear equations using intercepts

1. \(2x - 3y = 6\), Solution is: \(\{y = \frac{2}{3}x - 2\}\)

2. \(3y - 5x = 10\), Solution is: \(\{y = \frac{5}{3}x + \frac{10}{3}\}\)

3. \(-x + 4y - 8 = 0\), Solution is: \(\{y = \frac{1}{4}x + 2\}\)
4. $2x - 5y = 7$, Solution is: $\{y = \frac{2}{5}x - \frac{7}{5}\}$

5. $9 = 6x - y$, Solution is: $\{y = -9 + 6x\}$

6. $\frac{1}{2}x - y = 2$, Solution is: $\{y = \frac{1}{2}x - 2\}$
7. \(2x + \frac{1}{4}y + 3 = 0\), Solution is: \(y = -8x - 12\)

8. \(\frac{2}{3}x - \frac{1}{4}y = 2\), Solution is: \(y = \frac{8}{3}x - 8\)

9. \(-0.5x - 0.3y - 1.2 = 0\), Solution is: \(y = -1.667x - 4.0\)
10. $3.2x - y = 1.6$, Solution is: \( y = 3.2x - 1.6 \)

SECTION 2.2
ANSWERS — Slope

1. $-\frac{7}{8}$
2. 1
3. $-\frac{16}{9}$
4. $-\frac{17}{10}$
5. $-\frac{2}{3}$
6. $-\frac{5}{4}$
7. 
   a. $m = \frac{1}{3}$
   b. $m = -\frac{4}{3}$
   c. $m = \frac{1}{2}$
   d. $m = -\frac{4}{3}$
8. $m = \frac{1}{2}$
9. $m = \frac{3}{2}$

10. $m = -6$

11.

12.

13.
14. [Diagram showing a line graph]

15. d.
16. b.
17. c.
18. a.
19. f.
20. e.
21. No
22. Yes
23. -$150 per year
24. (9,7)

SECTION 2.2
ANSWERS — Horizontal and Vertical lines
1. $y = 4$
2. $x = -5$
3. $y = \sqrt{2}$
4. $y = 6$
5. $x-axis: y = 0$
   $y-axis: x = 0$
6. $x = 1$ and $x = -11$

SECTION 2.3
ANSWERS – The Point Slope Form of a Line

1. $y = -\frac{3}{2}x + \frac{7}{2}$
2. $y = 4x - 14$
3. \( y = \frac{2}{3}x - \frac{4}{3} \)
4. \( y = \sqrt{2}x + 7 \)
5. \( y = -\frac{3}{2}x - \frac{11}{3} \)
6. \( y = -\frac{6}{11}x + \frac{30}{11} \)
7. \( y = -2x - 2 \)
8. \( y + \frac{4}{5}x + \frac{8}{3} \)
9. a) \( y = \frac{1}{5}x + 70 \)
   b) 30
10. a) \( y = \frac{5}{54}x + 1 \)
      b) \( 7 \frac{1}{4} \)

SECTION 2.4
ANSWERS — Writing equations and determine the slope given an equation.

1. \( y = -\frac{2}{3}x + \frac{3}{2} \)
2. \( y = -0.8x - 3.7 \)
3. \( y = -7 \)
4. \( x = 0 \)
5. \( m = \frac{6}{7} , (0, 2\frac{1}{3}) \)
6. \( m = -2, (0, -2\frac{2}{3}) \)
7. \( m = \frac{1}{10} \)
8. \( m = -\frac{7}{12} \)

SECTION 2.4
ANSWERS — The General and Slope Intercept Forms

1. \( 3x + y = 7 \)
2. \( 3x - 4y = 2 \)
3. \( 6x - 5y = -45 \)
4. \( 33x - 10y = 75 \)

SECTION 2.4
ANSWERS — Graph Linear Functions

1. \( f(x) = -4x + 2.5 \)
2. \( g(x) = \frac{3}{5}x - 2 \)

3. \( h(x) = x - \sqrt{2} \)

4. \( i(x) = -\frac{1}{4}x + 1 \)
SECTION 2.4
ANSWERS — Parallel and Perpendicular lines

1. Parallel
2. Neither
3. Perpendicular
4. Neither
5. Neither
6. Perpendicular
7. Parallel
8. Neither
9. \( y = \frac{5}{3} x - 12 \)
10. \( y = \frac{4}{3} x + \frac{7}{2} \)
11. \( y = 2x + \frac{5}{2} \)
12. \( y = -\frac{8}{3} x - \frac{24}{5} \)
13. No
14. Yes
15. No
16. The slopes are negative reciprocals (their product is negative one), specifically 1 and -1