Name: ____________________________ Date: _____________________

Learning Goal 0.1	**Expectations for graphing from previous years.**

1. Find the slope of the line.
   a. Between the points $(-1,7)$ and $(-3,8)$.

   $$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{8-7}{(-3)-(-1)} \\ &= \frac{1}{(-2)} \\ &= -\frac{1}{2} \end{aligned}$$

   b. $2x - 7y = 14$

   $x -$ intercept
   $$2x = 14$$
   $$x = 7$$

   $y -$ intercept
   $$-7y = 14$$
   $$y = -2$$

   $$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{(-2)-0}{0-7} \\ &= \frac{-2}{-7} \\ &= \frac{2}{7} \end{aligned}$$

2. Find the equation of the line in slope – intercept form.
   a. Through $(-2,5)$ and $(-3,6)$.

   $$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{6-5}{(-3)-(-2)} \\ &= \frac{1}{-1} \\ &= -1 \end{aligned}$$

   $$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 5 &= -\big(x - (-2)\big) \\ y - 5 &= -(x+2) \\ y - 5 &= -x - 2 \\ y &= -x + 3 \end{aligned}$$

   b. $y - 5 = -\frac{1}{2}(x-4)$

   $$\begin{aligned} y - 5 &= -\frac{1}{2}x + 2 \\ y &= -\frac{1}{2}x + 7 \end{aligned}$$

3. Find the equation of the line in point – slope form.
   a. Horizontal line through $(-10,6)$

   $$y - 6 = 0$$

   b. Through $(1,5)$ and $(-2,-3)$.

   $$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{(-3)-5}{(-2)-1} \\ &= \frac{-8}{-3} \\ &= \frac{8}{3} \end{aligned}$$

   $$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 5 &= \frac{8}{3}(x-1) \end{aligned}$$

4. Without graphing, determine if the following points lie on the same line.

$$(4,3), (2,0), (-18,-12)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-0}{4-2} = \frac{3}{2}$$

$$y - y_1 = m(x - x_1)$$
$$y - 3 = \frac{3}{2}(x - 4)$$

$$-12 - 3 = \frac{3}{2}(-18 - 4)$$
$$-15 = \frac{3}{2}(-22)$$
$$-15 \neq -33$$

So these points do not lie on the same line.

5. Find k so that the line through $(4,-1)$ and $(k,2)$ is parallel to $2x + 3y = 6$.

$x -$ intercept
$$2x = 6$$
$$x = 3$$

$y -$ intercept
$$3y = 6$$
$$y = 2$$

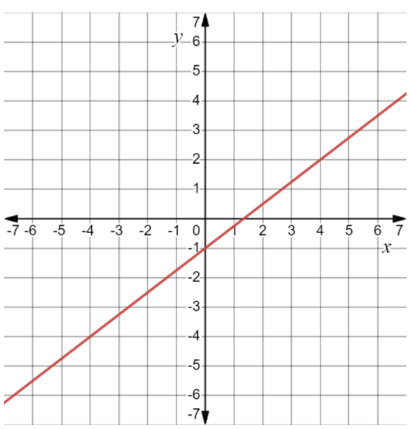
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-0}{0-3} = -\frac{2}{3}$$

Find k so that the slopes are equal.

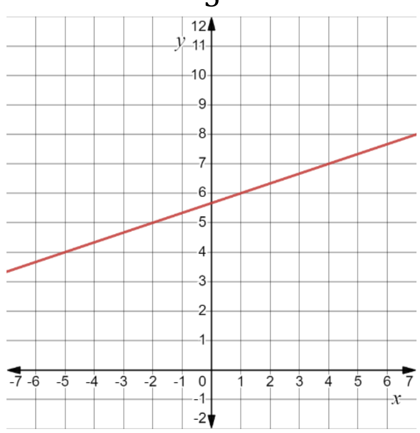
$$-\frac{2}{3} = \frac{2-(-1)}{k-4}$$
$$-\frac{2}{3} = \frac{3}{k-4}$$
$$2(k-4) = -9$$
$$k - 4 = -\frac{9}{2}$$
$$k = -\frac{1}{2}$$

6. Graph the following equations

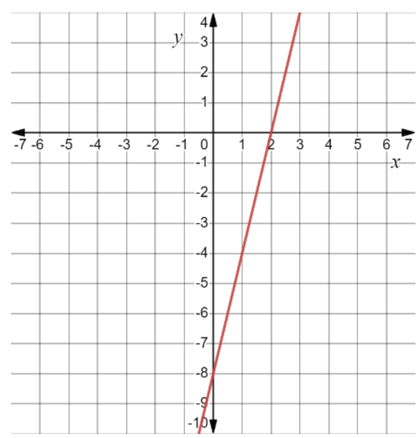
a. $y = 0.75x - 1$



b. $y - 5 = \frac{1}{3}(x + 2)$



c. $4x - y = 8$



7. The number of immigrants to California has been increasing linearly since the 1970s. In 1974, there were 86 821 people who immigrated to the state and the rate of increase has been 5 036 people per year since.
   a. Find an equation to represent the number of immigrants, $I(t)$, to California as a function of time, t.
      The point given is $(0, 86\ 821)$, the $y-$ intercept, and $m = 5\ 036$,
      $$I(t) = 5\ 036x + 86\ 821$$
   b. Use your result to predict how many immigrants will come to California in the year 2020. What assumption are you making?
      $$\begin{aligned} x &= 2020 - 1974 \\ &= 46 \end{aligned}$$
      $$\begin{aligned} I(46) &= 5\ 036(46) + 86\ 821 \\ &= 231\ 656 + 86\ 821 \\ &= 318\ 477 \text{ people} \end{aligned}$$
      The assumption is that the population has continued to grow at a linear rate.
   c. When did the number of immigrants reach 150 000?
      $$5\ 036x + 86\ 821 = 150\ 000$$
      $$5\ 036x = 63\ 179$$
      $$x \approx 12.54$$
      $$1974 + 12.54 = 1986$$
      The population will reach 150 000 people about half way through the year 1986.

8. The federal debt in the United States has been increasing at a linear rate. In 1991 it was 3.599 trillion dollars, and in 2000 it was 5.629 trillion dollars.
   a. Determine an equation in point – slope form to model the debt in trillions of dollars, $D(t)$, as a function of time, t, in years.
      The two points given in the question are $(0, 3.599)$ and $(9, 5.629)$.
      $$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{5.629 - 3.599}{9 - 0} \\ &= \frac{2.03}{9} \\ &\approx 0.23 \end{aligned}$$
      $$y - y_1 = m(x - x_1)$$
      $$D(t) - 5.629 = 0.23(t - 3.599)$$
   b. What is the slope and what does it represent?

      An increase in the American debt of approximately 0.23 trillion dollars a year.

c. Predict what the federal debt will be in 2020. What assumption are you making?

$$x = 29$$

$$D(29) - 5.629 = 0.23(29 - 3.599)$$
$$D(29) - 5.629 = 0.23(25.401)$$
$$D(29) - 5.629 = 5.729$$
$$D(29) = 11.36$$

The American debt will be approximately 11.36 trillion dollars, assuming that the debt has continued to grow at a linear rate.

9. The time between a person's initial infection with HIV and that person's eventual development of AIDS symptoms is an important issue to study. One study has found that, of those who caught HIV by intravenous drug use, 17% of patients had developed AIDS after 4 years and 33% had developed the disease after 7 years.
   a. Determine an equation in slope – point form that models this data.
      The two points given in the question are $(4, 17)$ and $(7, 33)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{33 - 17}{7 - 4} = \frac{16}{3} \approx 5.3$$

$$y - y_1 = m(x - x_1)$$
$$y - 17 = \frac{16}{3}(t - 4)$$

   b. What is the slope? What does it represent?

The increase in chance the patient has of developing AIDS from HIV year over year is about 5.3%.

   c. Use your equation to predict the number of years that will pass before half of the patients have developed AIDS symptoms.

$$50 - 17 = \frac{16}{3}(t - 4)$$
$$33 = \frac{16}{3}(t - 4)$$
$$6.188 \cong (t - 4)$$
$$t \cong 10.19$$

After 10 years, about half the cases of HIV will develop in to AIDS.