

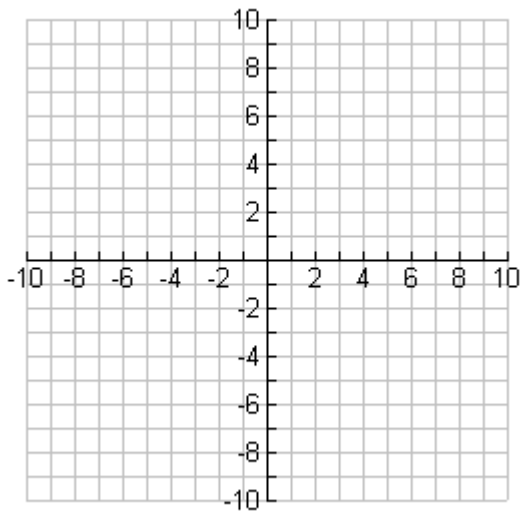
## Lesson 4.5

- Objectives:**
- To use slope-intercept form to write the equation of a line.
  - To use point-slope to write the equation of a line.
  - To write the equation of a line either parallel or perpendicular to a given line.
  - To solve application problems.

**EXAMPLE:** 1. Find the equation of the line with:

$m = \frac{2}{3}$  and containing the point  $(0, 4)$ .

We will use  $y = mx + b$  (Slope intercept form)



### Equation of a Line Given Its y-Intercept

Use the slope intercept form of the equation  $y = mx + b$ , to find the equation of a line if the slope and y intercept are known. If you are given two points and not the slope, you must first calculate the slope using  $m = \frac{y_2 - y_1}{x_2 - x_1}$ ,

then use  $y = mx + b$ .

2. Find the equation of the line with points:  
(0, -6), and ( 4, -2)

3. The following table shows the relationship between Celsius and Fahrenheit temperatures. The table lists two ordered pairs of equivalent temperatures on the two scales. Write an equation for converting degrees Celsius to degrees Fahrenheit.

Celsius C°	Fahrenheit F°
0°	32°
100°	212°

Use your equation to determine the temperature in degrees Fahrenheit when it is 85° C.

3. Find the equation of the line with:

$$m = \frac{-1}{3} \text{ and containing } (-3, 2)$$

Let's use the slope formula to find the equation.

$$m = \frac{y_2 - y_1}{x_2 - x_1}. \text{ Let's replace the } m \text{ with the slope and use the}$$

point for the  $x_1, y_1$ . To show that  $x$  and  $y$  remain variables we remove the subscripts.

Point Slope Form of the Equation of a Line:

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

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4. Find the equation of the line with:

Containing the points  $(-2, 5)$  and  $(3, -3)$

## Standard Form

Linear equations can also be written in standard form.

The standard form of a linear equation is  $Ax + By = C$  where  $A$ ,  $B$ , and  $C$  are real numbers.

5. Find the equation of the line containing the points:  $(3, -5)$  and  $(-3, 9)$ . Give your answer in standard form.

## Parallel and Perpendicular Lines

Two different lines are parallel if their slopes are equal.

Two lines are perpendicular if their slopes are negative reciprocals

$$m_2 = -\frac{1}{m_1} \text{ or } m_1 m_2 = -1$$

6. Find the equation of the line that is parallel to the line  $y = 4x - 7$  and contains the point  $(0, 5)$ .

7. Find the equation of the line that is perpendicular to the line  $3x + 4y = 24$  and contains the point  $(0, -6)$ .

### APPLICATIONS

1. A company manager is examining profits. He sees that the profit in May was \$52,000. He then discovers that his company's profits have been declining \$1000 each month thereafter.
- a. Let  $n$  represent the number of months and  $p$  represent the profit. Write an equation in slope intercept form that describes the profit  $n$  months after May.
- b. If the decline continues at the same rate, what will be the profit in nine months?

2. The demand for an item is a function of its price. As price goes up, demand goes down. On the other hand when price goes down demand goes up. Suppose the demand for a certain Beanie Baby is 1000 when its price is \$30 and 8000 when it costs \$15. Let  $x$  be the price and  $y$  be the demand for the Beanie Baby. Find an equation in slope intercept form relating the demand and the price. Use your equation to estimate the price if the demand is 4000.