

# WARM-UP...

. Determine the slope, the  $x$  intercept and the  $y$  intercept of the following line...

$$-\frac{3}{3}y = -\frac{6x-9}{-3}$$

$$y = 2x + 3$$

$$\text{slope} = 2$$

$$y\text{-Int.} = 3$$

$$6x - 3y + 9 = 0$$

$$\text{x-Int (y=0)}$$

$$6x + 9 = 0$$

$$6x = -9$$

$$x = \frac{-9}{6} = -\frac{3}{2}$$

2. Determine the equation for each of the following lines...

Put the equation in the **slope - y intercept form**.

a) passes through the points  $(-4, 6)$  &  $(0, -8)$ .

$$y = mx + b$$

$$y = mx - 8$$

$$y = -\frac{7}{2}x - 8$$

$$y = -\frac{14}{4}x - 8$$

OR Method B

$$y = mx - 8$$

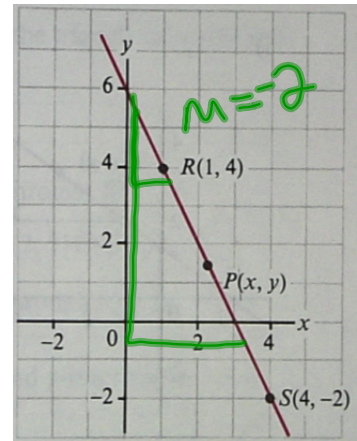
$$6 = m(-4) - 8$$

$$14 = -4m$$

$$\frac{14}{-4} = m$$

$$y = -\frac{7}{2}x - 8$$

b)



$$\underline{y = -2x + 6}$$

$$\#23/ \quad y = \frac{5}{3}x + c$$

$$F(4, -6)$$

$\uparrow \quad \uparrow$   
 $x \quad y$

$$-6 = \frac{5}{3}(4) + c$$

$$-6 = \frac{20}{3} + c$$

$$-6 - \frac{20}{3} = c$$

$$-\frac{38}{3} = c$$

$$-6(3) = \frac{5(4)}{3} + 3c$$

$$-\frac{18}{3} - \frac{20}{3} = c \quad \frac{-38}{3} = \frac{3c}{3}$$

$-38 = 3c$   
 $\frac{-38}{3} = c$

## 6.5 Slope-Point Form of the Equation for a Linear Function

### LESSON FOCUS

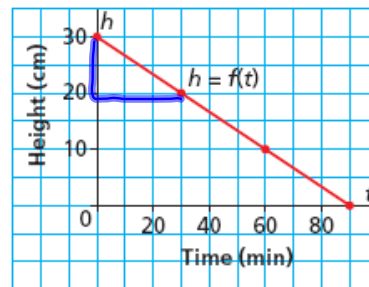
Relate the graph of a linear function to its equation in slope-point form.

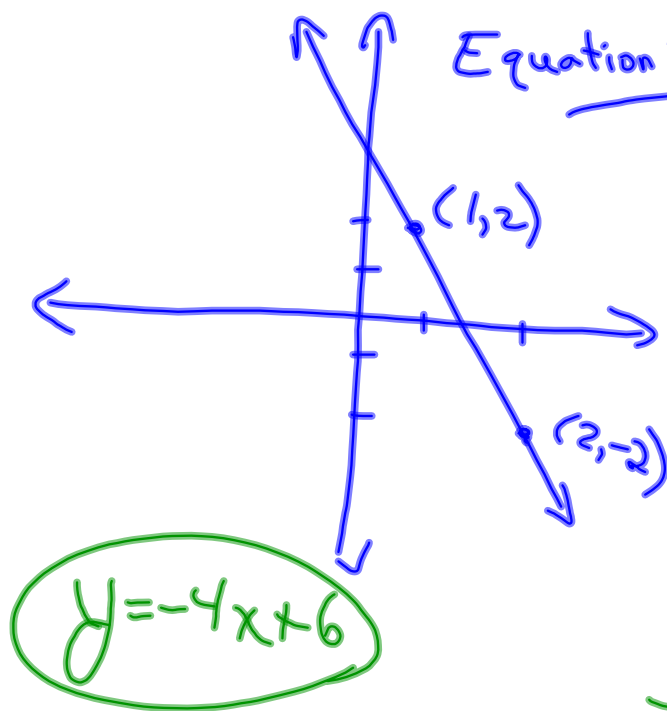
### Make Connections

$$y = mx + b$$

This graph shows the height of a candle as it burns.  
How would you write an equation to describe this line?  
Suppose you could not identify the  $h$ -intercept.  
How could you write an equation for the line?

$$h = -\frac{2}{3}t + 30$$





Equation of this line?  $y = mx + b$

$$m = \frac{2 - (-2)}{1 - 2} = \frac{4}{-1} = -4$$

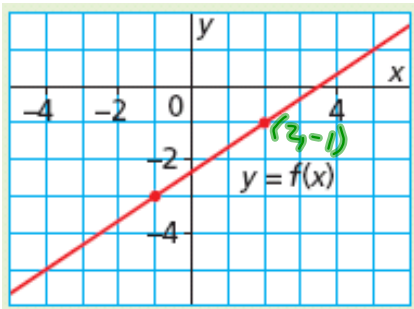
$$y = -4x + b$$

$$-2 = -4(2) + b$$

$$-2 = -8 + b$$

$$6 = b$$

- Determine the equation of this line



$$m = \frac{2}{3}$$

$$y = \frac{2}{3}x + b$$

$$-1 = \frac{2}{3}(2) + b$$

$$-1 = \frac{4}{3} + b$$

$$-1 - \frac{4}{3} = b$$

$$-\frac{7}{3} = b$$

$$y = \frac{2}{3}x - \frac{7}{3}$$

$$-3 = \frac{2}{3}(-1) + b$$

$$-3 = -\frac{2}{3} + b$$

$$-\frac{3}{1} + \frac{2}{3} = b$$

$$-\frac{9}{3} + \frac{2}{3} = b$$

$$-\frac{7}{3} = b$$

$$-3 = -\frac{2}{3} + b$$

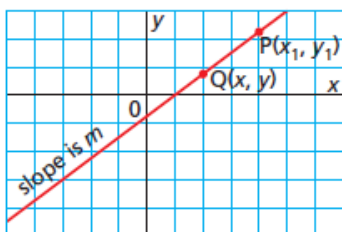
$$-9 = -2 + 3b$$

$$-9 + 2 = 3b$$

We can use this strategy to develop a formula for the slope-point form for the equation of a line.

This line has slope  $m$  and passes through the point  $P(x_1, y_1)$ .

Another point on the line is  $Q(x, y)$ .



The slope,  $m$ , of the line is:

$$m = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{y - y_1}{x - x_1}$$

Multiply each side by  $(x - x_1)$ .

$$m(x - x_1) = (x - x_1) \left( \frac{y - y_1}{x - x_1} \right)$$

Simplify.

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

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

?

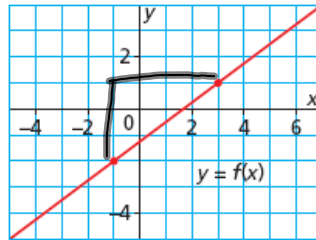
### Slope-Point Form of the Equation of a Linear Function

The equation of a line that passes through  $P(x_1, y_1)$  and has slope  $m$  is:

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

**Example 2****Writing an Equation Using a Point on the Line and Its Slope**

- a) Write an equation in slope-point form for this line.
- b) Write the equation in part a in slope-intercept form. What is the y-intercept of this line?



Point-Slope formula:

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

$$y - 1 = \frac{3}{4}(x - 3)$$

$$y - 1 = \frac{3}{4}x - \frac{9}{4}$$

$$y = \frac{3}{4}x - \frac{9}{4} + 1$$

$$y = \frac{3}{4}x - \frac{5}{4}$$

$$m = \frac{3}{4} \quad (3, 1)$$

$$y = \frac{3}{4}x + b$$

$$1 = \frac{3}{4}(3) + b$$

$$4 = 9 + 4b$$

$$-5 = 4b$$

$$-\frac{5}{4} = b$$

6.5 Slope-Point Form of the Equation for a Linear Function

$$m = \frac{y - y_1}{x - x_1}$$

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

$$3(x - 3) = 4(y - 1)$$

$$3x - 9 = 4y - 4$$

$$3x - 9 + 4 = 4y$$

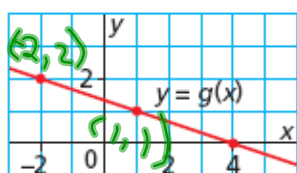
$$\frac{3x}{4} - \frac{5}{4} = \frac{4y}{4}$$

$$\frac{3x}{4} - \frac{5}{4} = y$$

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

2. a) Write an equation in slope-point form for this line.

b) Write the equation in part a in slope-intercept form.  
What is the  $y$ -intercept of this line?



$$m = -\frac{1}{3}$$

$$(a) \begin{aligned} y - y_1 &= m(x - x_1) \\ y - 2 &= \left[ -\frac{1}{3}(x + 2) \right] \end{aligned}$$

$$(b) \begin{aligned} 3y - 6 &= -1(x + 2) \\ 3y - 6 &= -x - 2 \\ \frac{3}{3}y &= -\frac{x}{3} + \frac{4}{3} \\ y &= -\frac{1}{3}x + \frac{4}{3} \end{aligned}$$