

Math 116
Section 6.3 Linear Models

Slope-intercept form of an equation

$$y = mx + b$$

$$m = \text{slope}$$

$$b = y\text{-intercept}$$

Example 1

Write the equation of the line that passes through the given points. (Use the equation to graph the line. $(-3,-4)$ and $(1,4)$)

$$\text{Find the slope first: } m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - (-4)}{1 - (-3)} = \frac{8}{4} = 2$$

Next, use the point slope formula and write answer in slope-intercept form with the either point $(-3,-4)$ and $(1,4)$. This example use the point $(1,4)$

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

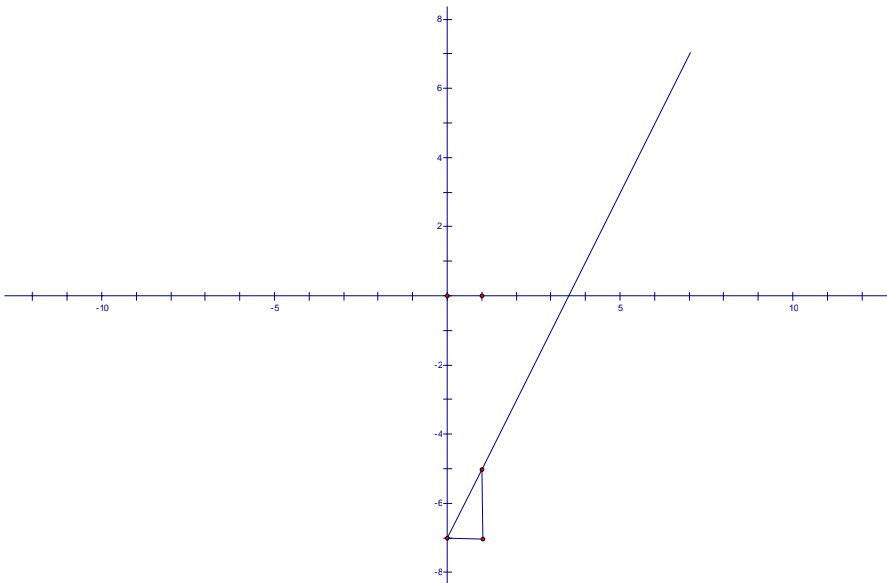
$$y - 4 = 2(x - 1)$$

$$y - 4 = 2x - 2$$

$$y - 4 + 4 = 2x - 2 + 4$$

$$y = 2x + 2$$

$$m = 2, b = 2$$



Example 2

Write the equation of the line that passes through the given points. (Use the equation to graph the line. (2,3) and (5,5)

$$\text{Find the slope first: } m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 3}{5 - 2} = \frac{2}{3}$$

Next, use the point slope formula and write answer in slope-intercept form with the either point (2,3) and (5,5). This example use the point (2,3)

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

$$y - 3 = \frac{2}{3}(x - 2)$$

$$y - 3 = \frac{2}{3}x - \frac{4}{3}$$

$$y - 3 + 3 = \frac{2}{3}x - \frac{4}{3} + 3$$

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

Example 3

Find equation of a line given $m = -2$ and the line passes through (1,3)

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

$$y - 3 = -2(x - 1)$$

$$y - 3 = -2x + 2$$

$$y - 3 + 3 = -2x + 2 + 3$$

$$y = -2x + 5$$

Example 4

A general building contractor estimates that the cost to build a new home is \$40,000 plus \$89 per square foot of floor space in the house. Determine a linear function that gives the cost of building a house. Use the model to find the cost to build a 1500 square foot house.

$$\text{Rate} = 85$$

$$\text{Initial Cost} = 40,000$$

$$f(x) = mx + b$$

$$f(x) = 85x + 40,000$$

$$f(1500) = 85(1500) + 40,000$$

$$f(1500) = 127,500 + 40,000 = \$167,500$$

Example 5

A plane can travel 1030 miles in two hours. Find a linear model to predict the number of miles that the plane can travel in a certain number of hours. Use the model to predict how far the plane will travel in 5 hours

$$\text{Rate} = \frac{1030 \text{ mi}}{2 \text{ hr}} = 515 \frac{\text{mi}}{\text{hr}}$$

$$f(x) = mx + b$$

$$f(x) = 515x + 0 = 515x$$

$$f(5) = 515(5) = 2575 \text{ miles}$$

Example 6

A shoe store discovered that if sold a pair of running shoes at \$60 per pair they sold 20 pairs of shoes in one week. The store also discovered that if they sold the shoes for \$45 per pair, they ended up selling 45 pairs of shoes in one week. Find a model that will find the number of shoes sold a week at a price of x dollars per pair.

$$m = \frac{\$60 - \$45}{45 - 20} = \frac{\$15}{25} = \$.60$$

$$f(x) = .60x$$