Name: _____ Date: _____

Slope Intercept Form

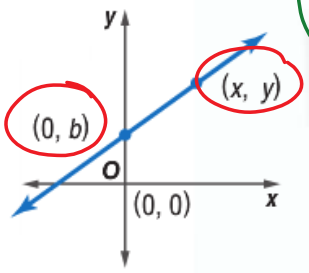
In a nonproportional linear relationship, the graph passes through the point $(0, b)$ or the y-intercept. The **y-intercept** of a line is the y-coordinate of the point where the line crosses the y-axis.

Complete the steps to derive the equation for a nonproportional linear relationship by using the slope formula.

$\frac{y_2 - y_1}{x_2 - x_1} = m$ Slope formula

$(x_1, y_1) = (0, b)$

$(x_2, y_2) = (x, y)$



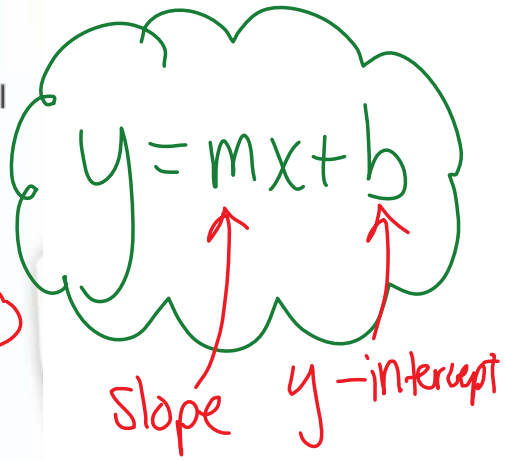
$\frac{y - b}{x - 0} = m$

$(x)\ \frac{y-b}{x} = m(x)$ Simplify.

$y - b = m \cdot x + b$ Multiplication Property of Equality

$+b \quad +b$

$y = mx + b$ Addition Property of Equality



Slope-Intercept Form of a Line

Nonproportional linear relationships can be written in the form of $y = mx + b$. This is called **slope-intercept form**. When an equation is written in this form, m is the slope and b is the y-intercept.

Examples

Tutor

1. **State the slope and the y-intercept of the graph of the equation $y = \frac{2}{3}x - 4$.** $y = \frac{2}{3}x + (-4)$

$m = \frac{2}{3}$ $b = -4$

Got It? Do these problems to find out.

a. $y = -5x + 3$ $m = -5$, $b = 3$

b. $y = \frac{1}{4}x - 6$ $m = \frac{1}{4}$, $b = -6$

c. $y = -x + 5$ $m = -1$, $b = 5$

Examples

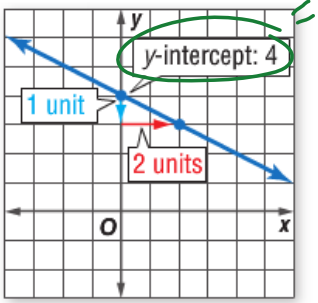
Tutor

2. **Write an equation of a line in slope-intercept form with a slope of −3 and a *y*-intercept of −4.**

$y = mx + b$

$y = -3x - 4$

3. **Write an equation in slope-intercept form for the graph shown.**



$b = 4$

$m = \frac{-1}{2}$

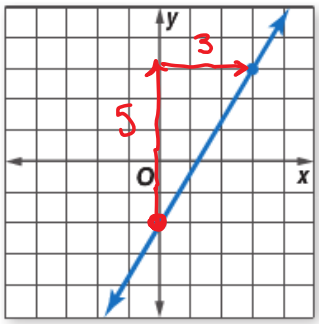
$y = -\frac{1}{2}x + 4$

Got It? Do these problems to find out.

d. Write an equation in slope-intercept form for the graph shown.

e. Write an equation of a line in slope-intercept form with a slope of $\frac{3}{4}$ and a *y*-intercept of −3.

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



(d) $m = \frac{5}{3}$

$b = -2$

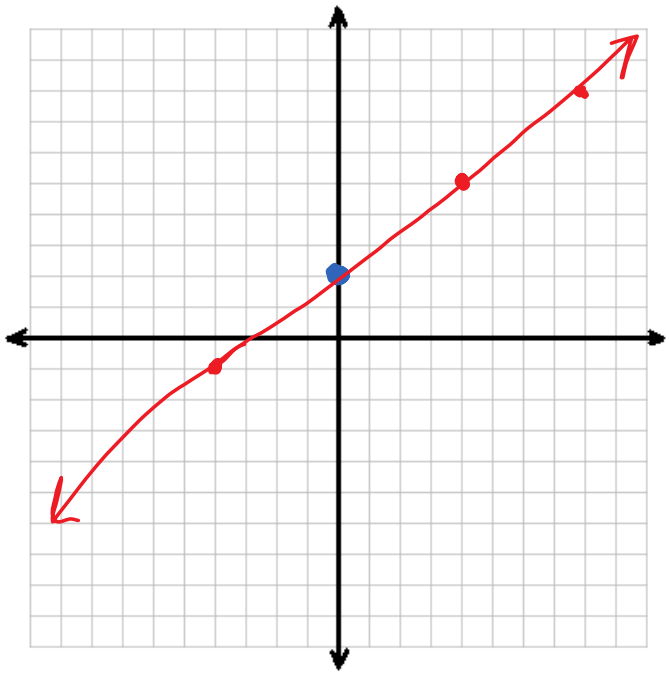
$y = \frac{5}{3}x - 2$

Graphing using Slope-Intercept Form

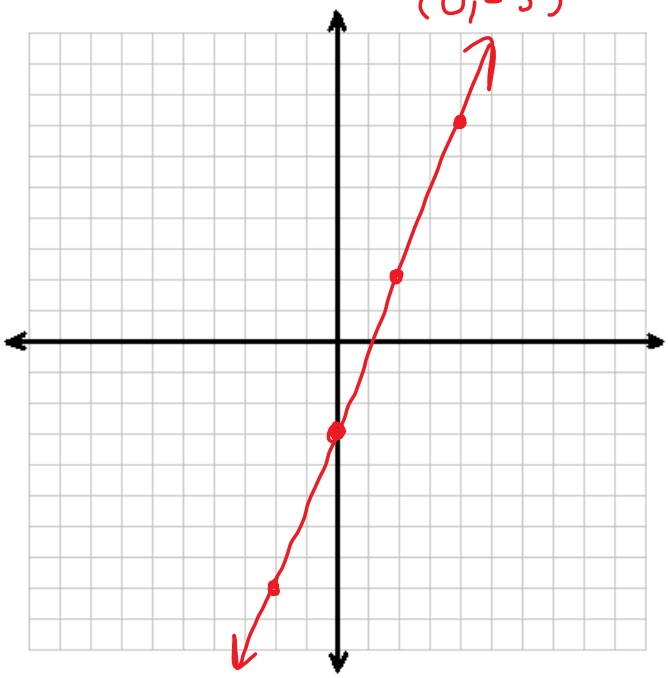
Example A: Graph $y = \frac{3}{4}x + 2$.

$m = \frac{3}{4}$

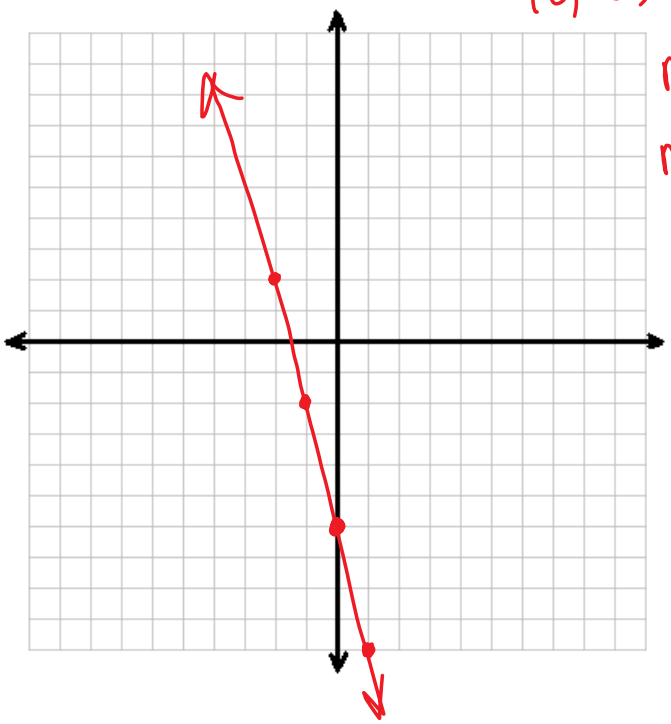
$b = 2 \rightarrow (0, 2)$



Example B: Graph $y = \frac{5}{2}x - 3$.

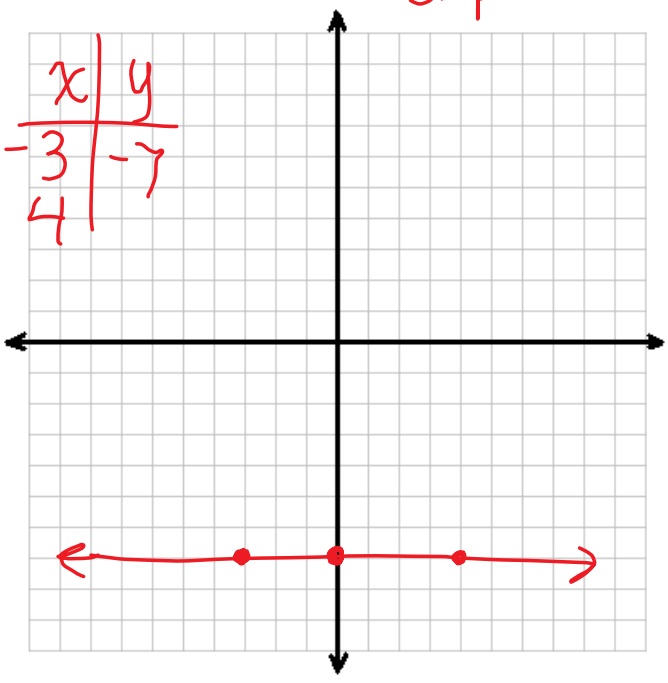


Example C: Graph $y = -4x - 6$.

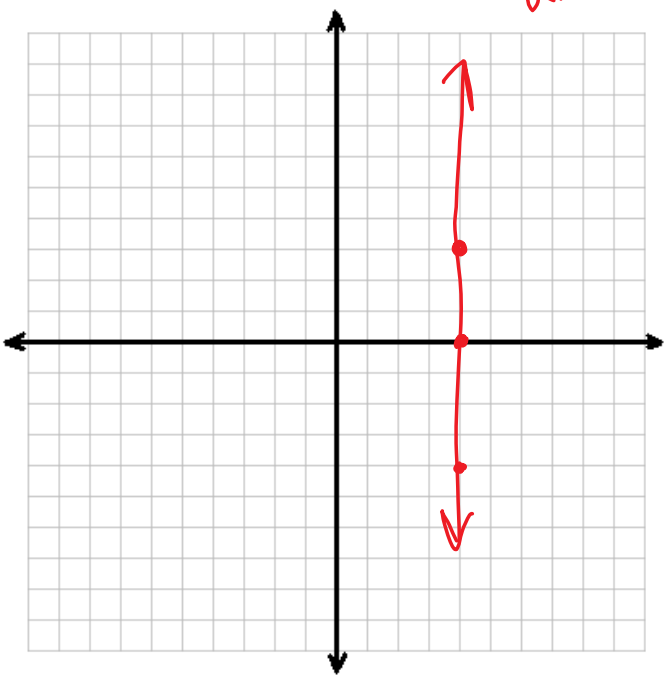


$y = 0x - 7$

Example D: Graph $y = -7$.



Example E: Graph $x = 4$.



Interpret the y - intercept

When an equation in slope-intercept form applies to a real-world situation, the slope represents the rate of change and the *y*-intercept represents the initial value.

Examples

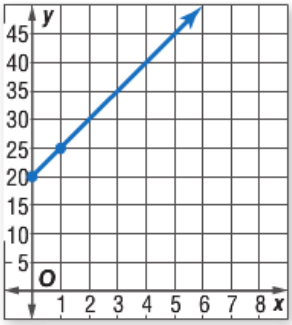
Watch Tutor

4. **Student Council is selling T-shirts during spirit week. It costs $20 for the design and $5 to print each shirt. The cost *y* to print *x* shirts is given by $y = 5x + 20$. Graph $y = 5x + 20$ using the slope and *y*-intercept.**

Step 1 Find the slope and *y*-intercept.
$y = 5x + 20$ slope = 5, *y*-intercept = 20

Step 2 Graph the *y*-intercept (0, 20).

Step 3 Write the slope 5 as $\frac{5}{1}$. Use it to locate a second point on the line. Go up 5 units and right 1 unit. Then draw a line through the points.



5. **Interpret the slope and the *y*-intercept.**

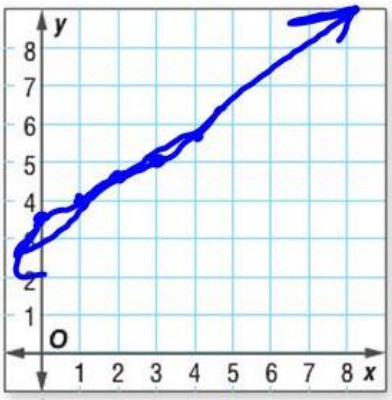
The slope 5 represents the cost in dollars per T-shirt. The *y*-intercept 20 is the one-time charge in dollars for the design.

Got It? Do these problems to find out.

A taxi fare *y* can be determined by the equation $y = 0.50x + 3.50$, where *x* is the number of miles traveled.

f. Graph the equation.

g. Interpret the slope and the *y*-intercept.



$0.50
Slope represents the cost per mile. Y-intercept of 3.5 represents the initial cost of $3.50.