

Lesson 5-3

Example 1 Write an Equation Given Slope and y-intercept

Write an equation of the line whose slope is $-\frac{2}{3}$ and whose y-intercept is -2 .

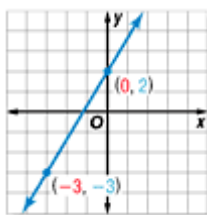
$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = -\frac{2}{3}x + -2 \quad \text{Replace } m \text{ with } -\frac{2}{3} \text{ and } b \text{ with } -2.$$

$$y = -\frac{2}{3}x - 2 \quad \text{Simplify.}$$

Example 2 Write an Equation Given Two Points

Write an equation of the line shown in the graph.



Step 1 You know the coordinates of two points on the line. Find the slope. Let $(0, 2) = (x_1, y_1)$ and $(-3, -3) = (x_2, y_2)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \begin{array}{l} \text{rise} \\ \text{run} \end{array}$$

$$m = \frac{-3 - 2}{-3 - 0} \quad x_1 = 0, x_2 = -3, y_1 = 2, \text{ and } y_2 = -3$$

$$m = \frac{-5}{-3} \text{ or } \frac{5}{3} \quad \text{Simplify}$$

$$\text{The slope is } \frac{5}{3}.$$

Step 2 The line crosses the y-axis at $(0, 2)$. So, the y-intercept is 2.

Step 3 Finally, write the equation.

$$y = mx + b \quad \text{Slope-intercept form}$$

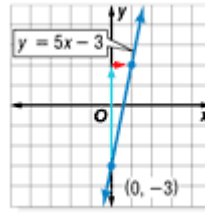
$$y = \frac{5}{3}x + 2 \quad \text{Replace } m \text{ with } \frac{5}{3} \text{ and } b \text{ with } 2.$$

The equation of the line is $y = \frac{5}{3}x + 2$.

Example 3 Graph an Equation in Slope-Intercept Form

Graph $y = 5x - 3$.

Step 1 The y-intercept is -3 . so, graph $(0, -3)$.



Step 2 The slope is 5 or $\frac{5}{1}$. $\frac{\text{rise}}{\text{run}}$
From $(0, -3)$, move up 5 units and right 1 unit.
Draw a dot.

Step 3 Draw a line connecting the points.

Example 4 Graph an Equation in Standard Form

Graph $x + 2y = -6$.

Step 1 Solve for y to find slope-intercept form.

$$x + 2y = -6$$

Original equation

$$x + 2y - x = -6 - x$$

Subtract x from each side.

$$2y = -6 - x$$

Simplify.

$$2y = -x + -6$$

$-6 - x = -6 + (-x)$ or $-x + -6$

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

Divide each side by 2.

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

Divide each term in the numerator by 2.

$$y = -\frac{1}{2}x + -3$$

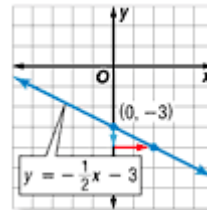
Simplify.

$$y = -\frac{1}{2}x - 3$$

Step 2 The y-intercept of $y = -\frac{1}{2}x - 3$ is -3 .

So, graph $(0, -3)$.

Step 3 The slope is $-\frac{1}{2}$ or $\frac{-1}{2}$. From $(0, -3)$, move down 1 unit and right 2 units. Draw a dot.



Step 4 Draw a line containing the points.

Example 5 Write an Equation in Slope-Intercept Form

In 1990, the average cost of tuition and fees for attending a college or university in the U.S. was \$1454 per year. Since that time, the average cost of tuition and fees has been increasing by \$114.60 per year. Source: *The World Almanac*

a. Write a linear equation to find the average cost for tuition in any year after 1990.

Words The amount of tuition and fees has increased \$114.60 per year, so the rate of change is \$114.60 per year. In the first year (1990), the cost was \$1454.

Variables Let C = average cost.
Let n = number of years after 1990.

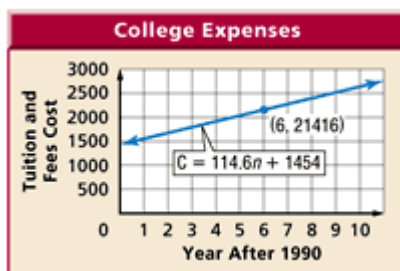
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Equation average cost equals rate of change times number of years after 1990 plus amount at start

C = 114.6 \times n + 1454

b. Graph the equation.

The graph passes through (0, 1454) with a slope of 114.6.



c. Find the cost for tuition and fees for 1996.

The year 1996 is 6 years after 1990. So, $n = 6$.

$C = 114.6n + 1454$ Cost equation

$C = 114.6(6) + 1454$ Replace n with 6.

$C = 2141.6$ Simplify

So, the average cost for tuition and fees for 1996 was \$2141.60.

Check Notice that (6, 2141.6) lies on the graph.