6.4 Slope-Intercept Form of the Equation for a Linear Function

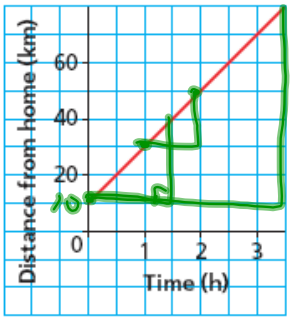
LESSON FOCUS Relate the graph of a linear function to its equation in slope-intercept form.

Make Connections

This graph shows a cyclist's journey where the distance is measured from her home.

1) What does the vertical intercept represent?
2) What does the slope of the line represent?

Graph of a Bicycle Journey



1) Starts 10 km from home

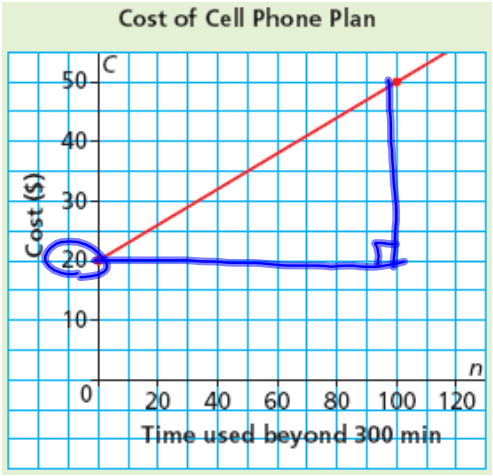
2) Slope $= \frac{\Delta y}{\Delta x} = \frac{30 \text{ km}}{1.5 \text{ hrs.}} = 20 \text{ km/h}$

$y = 20x + 10$

ROC y-Intercept

How do you know this is the graph of a linear function?
What does the slope of the graph represent?

m ⇒ Cost/min beyond 300



Write an equation to describe this function.
Verify that your equation is correct.

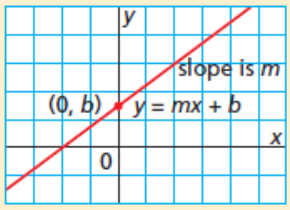
$\text{Slope} = \frac{\$30}{100\text{min.}} = \frac{\$0.3}{\text{min.}}$

$y = 0.3x + 20$

In general, any linear function can be described in **slope-intercept form.**

Slope-Intercept Form of the Equation of a Linear Function

The equation of a linear function can be written in the form $y = mx + b$, where m is the slope of the line and b is its y-intercept.



$y = mx + b$

slope y-Intercept

Example 1 Writing an Equation of a Linear Function Given Its Slope and *y*-Intercept

The graph of a linear function has slope $\frac{3}{5}$ and y-intercept -4.

Write an equation for this function.

$y = mx + b$

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

$y = mx + b$

1. The graph of a linear function has slope $-\frac{7}{3}$ and y-intercept 5.

Write an equation for this function.

$y = -\frac{7}{3}x + 5$

Example 2 Graphing a Linear Function Given Its Equation in Slope-Intercept Form

Graph the linear function with equation: $y = \frac{1}{2}x + 3$

Slope $= \frac{1}{2}$

y-Intercept $= 3$

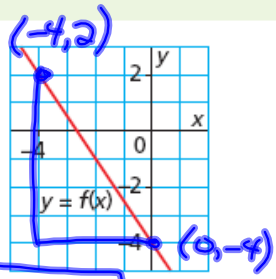
$(0, 3)$

Slope of a line $\perp$ to this line?

$m = -2$

Example 3 Writing the Equation of a Linear Function Given Its Graph

Write an equation to describe this function. Verify the equation.

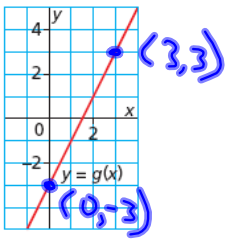


$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6}{-4} = -\frac{3}{2}$

y-Intercept = −4

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

3. Write an equation to describe this function. Verify the equation.



$m = \frac{6}{3}$

$m = 2$

$b = -3$

$y = 2x - 3$

x	y
3	3

Verify

Example 4 Using an Equation of a Linear Function to Solve a Problem

The student council sponsored a dance. A ticket cost $5 and the cost for the DJ was $300.

a) Write an equation for the profit, P dollars, on the sale of t tickets.

b) Suppose 123 people bought tickets. What was the profit?

c) Suppose the profit was $350. How many people bought tickets?

d) Could the profit be exactly $146? Justify the answer.

(a) $P = 5t - 300$

(b) $P = 5(123) - 300$

$P = 315$

c) $350 = 5t - 300$

$\frac{650}{5} = \frac{5t}{5}$

$t = 130$

(d) Must be multiple of 5 ∴ No

Slope - Y Intercept Form

- is of the form... $y = mx + b$, where m is the slope
  b is the y intercept
- if you are given **m** and **b**, then you can get the equation of the line.

ex: Determine the **slope** and **y-intercept** of the following line.

$3(2y - 1) = -2(x + 5)$

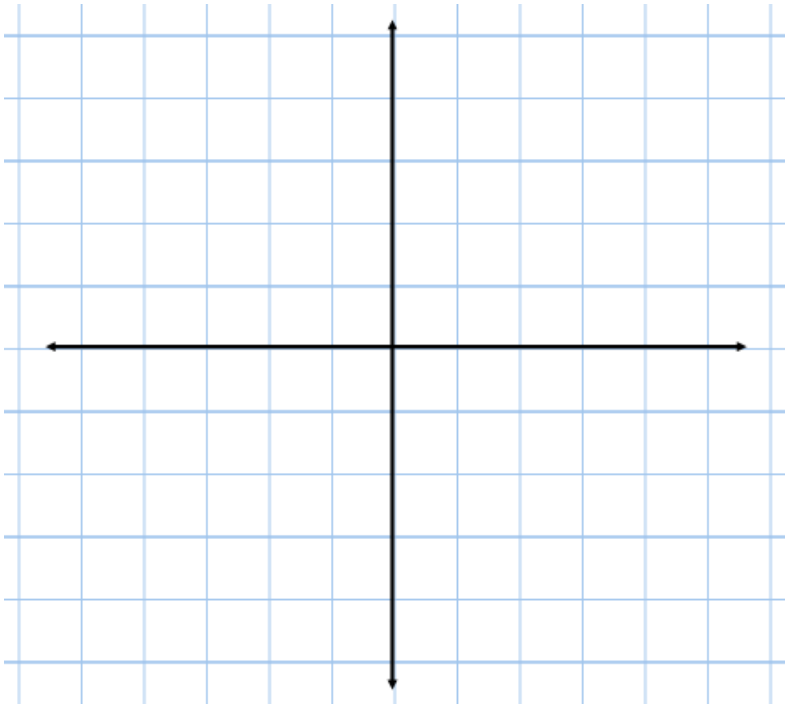
$6y = -2x - 10 + 3$

$\frac{6y}{6} = \frac{-2x}{6} - \frac{7}{6}$

$y = -\frac{1}{3}x - \frac{7}{6}$ $\Rightarrow$ $m = -\frac{1}{3}$, $b = -\frac{7}{6}$

ex: sketch the line that passes through the points (3, -4) & (0, 4)

- Determine the equation of this line



ex. Find slope and y-Intercept of

$7x - 3y + 12 = 0$

$\begin{cases} y = mx + b \\ mx + b = y \end{cases}$

$\frac{-3y}{-3} = \frac{-7x}{-3} - \frac{12}{-3}$

$y = \frac{7}{3}x + 4$

$m = \frac{7}{3} \quad b = 4$

Ex. 2

Find the slope of a line perpendicular to the line $\frac{3}{4}(x-5) + 7y = 8(x-2)$

$3x - 15 + 28y = 32x - 64$

$28y = 32x - 3x - 64 + 15$

$\frac{28y}{28} = \frac{29x}{28} - \frac{49}{28}$

$y = mx + b$

$y = \frac{29}{28}x - \frac{49}{28}$

$m = \frac{29}{28}$

$-\frac{1}{m} = -\frac{28}{29}$

Practice Problems...

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