(−, #)

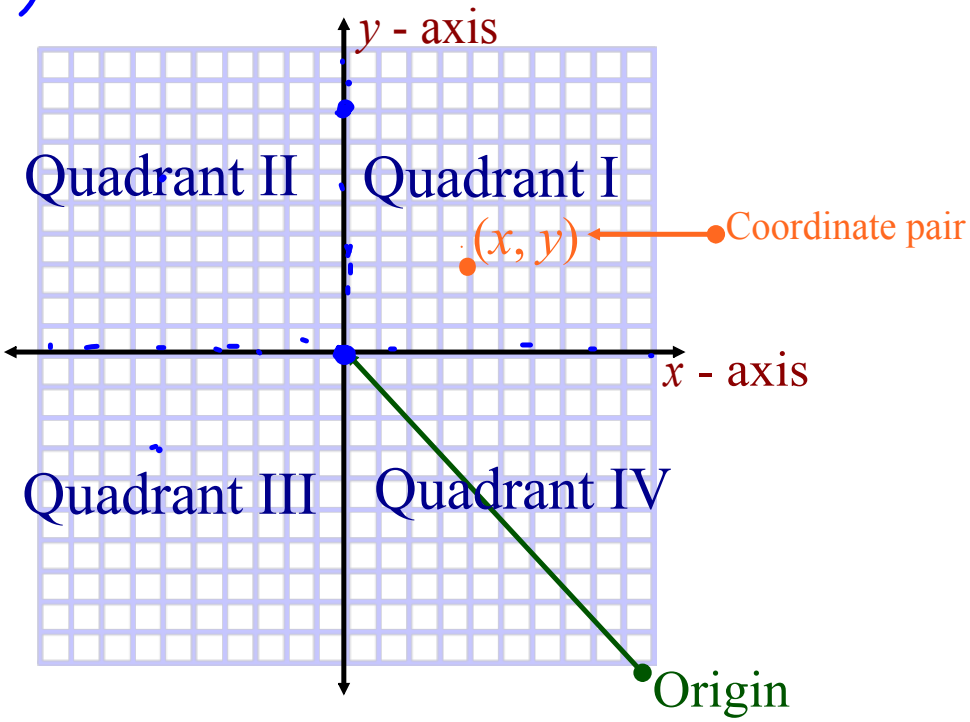
(−, −)

(0, +)

(−, 0)

Quadrantal

Cartesian Plane



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.

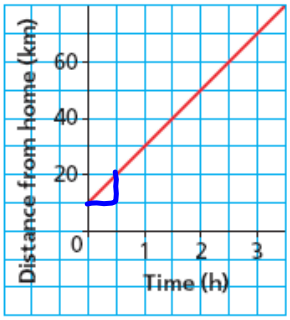
Make Connections

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

What does the vertical intercept represent?

What does the slope of the line represent?

Graph of a Bicycle Journey



Vertical Intercept (0, 10) ← distance from home he started

Speed

Slope: $\frac{\Delta y}{\Delta x} = \frac{\Delta d}{\Delta t} = ROC$ $\frac{10\text{km}}{0.5\text{h}} = 20\text{ km/h}$

Finding Intercepts

- ***x* - intercept**: - a point where the graph crosses the *x*-axis.
- to find the *x*-intercept ⇒ let $y = 0$ & solve for *x*.

- ***y* - intercept**: - a point where the graph crosses the *y*-axis.
- to find the *y*-intercept ⇒ let $x = 0$ & solve for *y*.

Example: Find both intercepts given the line...

$$3x - 6y = 12$$

x-Intercept (y=0)

$3x - 6(0) = 12$

$3x - 0 = 12$

$\frac{3x}{3} = \frac{12}{3}$

$x = 4$

$(4, 0)$

y-Intercept (x=0)

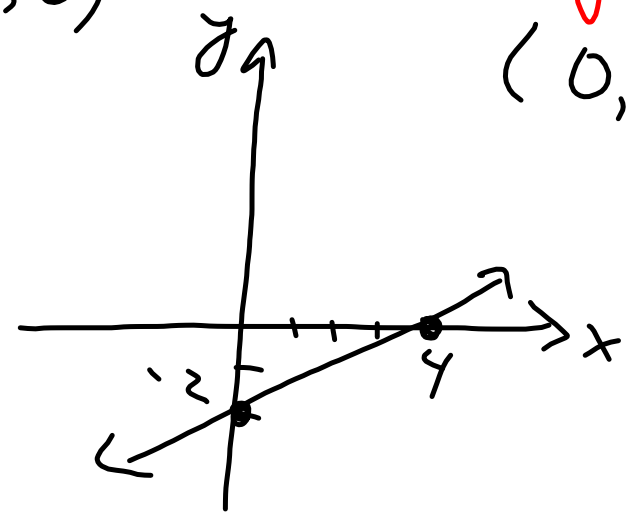
$3(0) - 6y = 12$

$0 - 6y = 12$

$\frac{-6y}{-6} = \frac{12}{-6}$

$y = -2$

$(0, -2)$



Find both the x & y Intercepts:

① $3y = 9 - 4x$

x-Int: $(y=0)$

$0 = 9 - 4x$

$\frac{4x}{4} = \frac{9}{4}$

$x = \frac{9}{4} \Rightarrow \left(\frac{9}{4}, 0\right)$

y-Int: $(x=0)$

$\frac{3y}{3} = \frac{9}{3}$

$y = 3 \Rightarrow (0, 3)$

② $\frac{2}{3}y - \frac{3}{4}x = -1$

x-Int $(y=0)$

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

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

$x = \frac{4}{3} \Rightarrow \left(\frac{4}{3}, 0\right)$

y-Int $(x=0)$

$(3)\,\frac{2}{3}y = -1(3)$

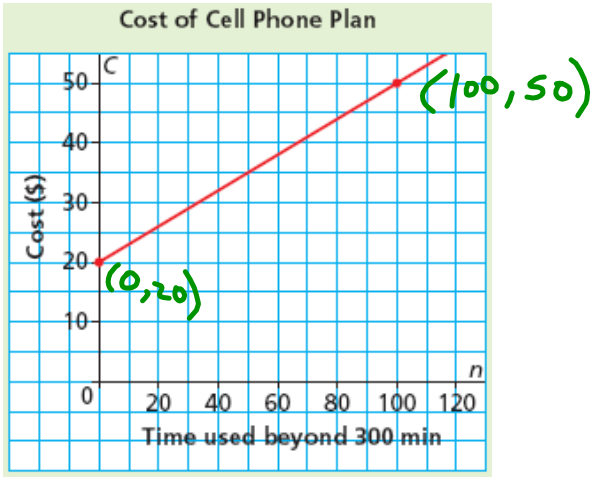
$\frac{2y}{2} = \frac{-3}{2}$

$y = \frac{-3}{2} \Rightarrow \left(0, \frac{-3}{2}\right)$

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

Line

Slope = $\frac{\Delta \text{cost}}{\Delta \text{time}}$ $\frac{\#}{\text{min}}$



$M = \frac{50-20}{100-0} = \frac{30}{100} = 0.3$

$M = \frac{y_2 - y_1}{x_2 - x_1}$

30¢/min

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

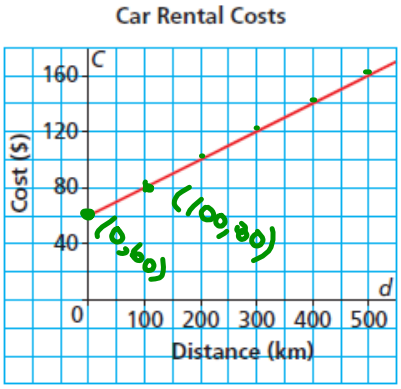
$C = 20 + 0.30(n)$

y-Intercept, slope

$C = 0.3n + 20$

slope, y-Int

In Chapter 5, Lesson 5.6, we described a linear function in different ways. The linear function below represents the cost of a car rental.



An equation of the function is:
$C = 0.20d + 60$

The number 0.20 is the rate of change, or the slope of the graph. This is the cost in dollars for each additional 1 km driven.

The number 60 is ?

$m = \frac{80-60}{100-0}$

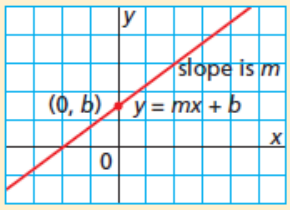
$m = \frac{20}{100} = 0.2$

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

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.



Slope y-Intercept form

$$y = mx + b$$

m: Slope

b: y-Intercept

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

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.

$y = mx + b$

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

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

$(5,-1), (10,2)$

$(0,-4)$ Rise = 3, Run = 5

$(5,-1)$

$(10,2)$

$(0,-4)$ is on this line. What are 2 others?

x	y	
5	-1	$\Leftarrow \frac{3}{5}(5) - 4$
10	2	$\Leftarrow \frac{3}{5}(10) - 4$
100	56	$\frac{3}{5}(100) - 4$

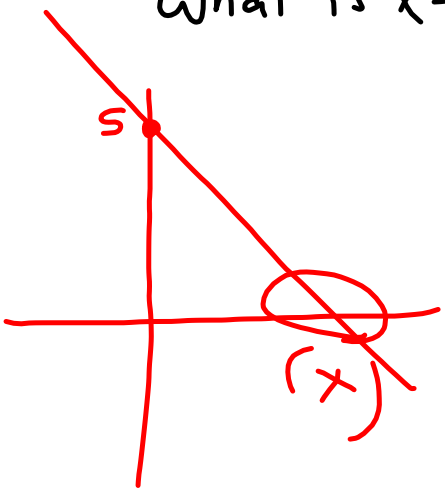
YOUR TURN...

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

$y = mx + b$

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

What is x-Intercept?



$0 = \frac{-7}{3}x + 5$ -5

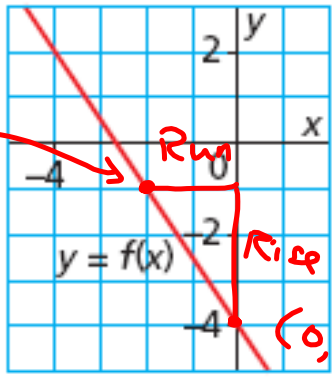
$(3) -5 = \frac{-7}{3} x (3)$

$\frac{-15}{-7} = \frac{-7x}{-7}$

$\frac{15}{7} = x$

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

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



$b = -4$

$(-2, -1)$

$M = \frac{-4-(-1)}{0-(-2)}$

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

Run

Rise

$(0, -4)$

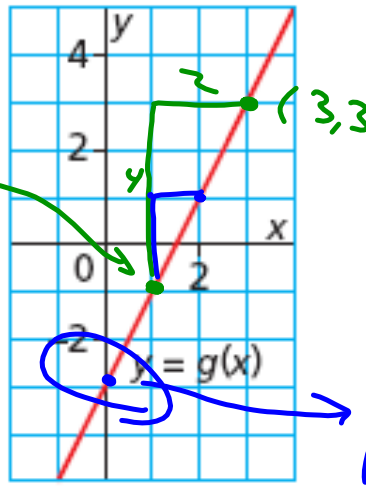
$y = -\frac{3}{2}x - 4$ ← $y = mx + b$

YOUR TURN...

Slope y-Intercept form

$y = mx + b$ (slope, y-Int.)

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



(1,-1) (3,3)

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

$m = \frac{4}{2}$

$m = 2$

y-Intercept: $b = -3$

Interpolate

extrapolate

$y = mx + b$

$y = 2x - 3$ Really??

x	y
1	-1
2.5	2

$y = 2(1) - 3$

$y = 2 - 3$

$y = -1$

$y = 2(2.5) - 3$

$= 5 - 3$

$= 2$

x	y
100	197

$y = 2(100) - 3$

$y = 200 - 3$

$y = 197$

a) $y = \frac{3}{4}x - 7$ (m, b)

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

$b = -7$

$y = 4x + 8$

$m = 4$

$b = 8$

$y = \frac{1}{7}x - 2$

$m = \frac{1}{7}$

$b = -2$

$y = \frac{1}{7}x$

$y = mx + b$

ex. $3x + 2y - 8 = 0$

$\frac{2y}{2} = -\frac{3}{2}x + \frac{8}{2}$

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

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

Slope = ?

y-Intercept = ?

y-Int (Let $x = 0$)

$0 + 2y - 8 = 0$

$\frac{2y}{2} = \frac{8}{2}$

$y = 4$

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

$2(3y - 1) = -2(x + 7)$

$y = mx + b$

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

$b = -2$

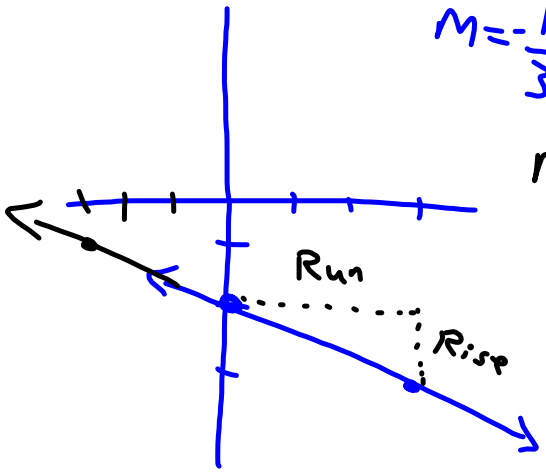
$6y - 2 = -2x - 14$

$6y = -2x - 14 + 2$

$\frac{6y}{6} = \frac{-2x}{6} - \frac{12}{6}$

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

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



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

EXAMPLE:
Determine the equation of the line that passes through the points (3, -4) & (0, 4)

$y = mx + b$

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

$m = \frac{4-(-4)}{0-3}$

$m = \frac{8}{-3}$

$x = 0$ at the y-Int.

$b = 4$

$y = -\frac{8}{3}x + 4$

$y = -\frac{8}{3}x + b$

$-4 = -\frac{8}{3}(3) + b$

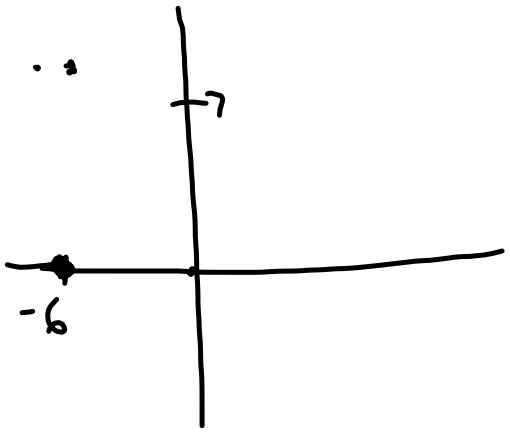
$-4 = -8 + b$

$-4 + 8 = b$

$4 = b$

ex. Find equation of a line with slope 7 and x-Intercept -6.

$m = 7$ $(-6, 0)$ (x, y)



$y = mx + b$

$y = 7x + b$

$0 = 7(-6) + b$

$0 = -42 + b$

$42 = b$

$y = 7x + 42$

Practice Problems...

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#4, 5, 8, 11, 12, 18, 19, 20

Pg. 364
Extra: #22, 23, 24

Due at Beginning of class tomorrow if you want extra marks