Direct Variation

What is it? a linear equation whose graph goes through (0,0)
a relationship that can be represented by a function in the form $y = kx$, where $k \neq 0$

Constant:

$k = \frac{y}{x}$ is constant for all ordered pairs

Equation:

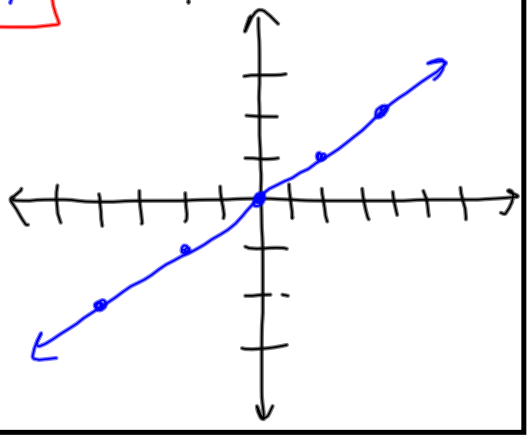
$y = mx$ (y-int is 0) ($y = kx$ or $y = ax$)

m ↓ constant

Table: $y = \frac{1}{2}x$

	x	y
	-4	-2
	-2	-1
*	0	0
	2	1
	4	2

Graph.



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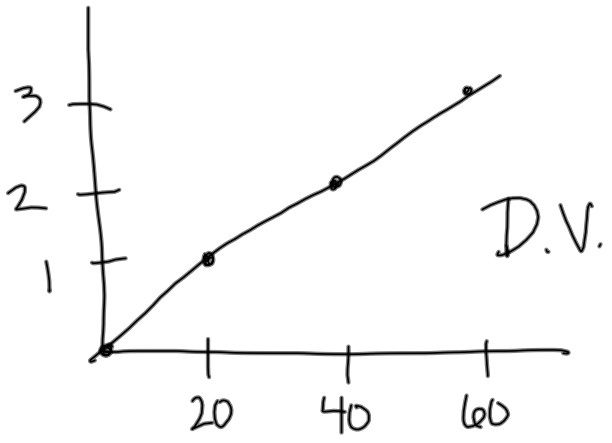

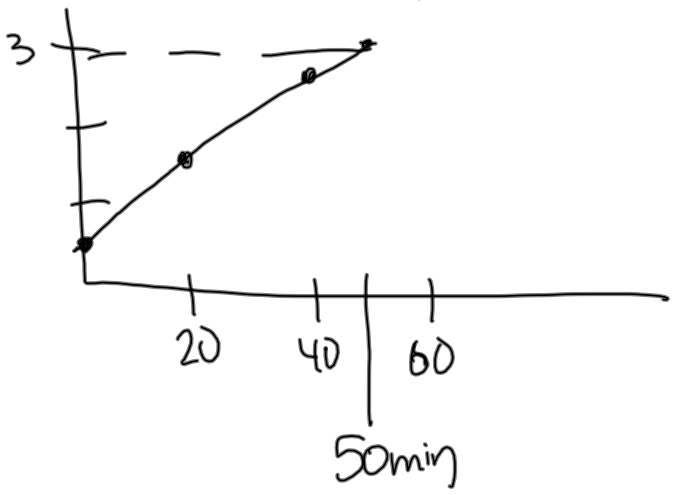

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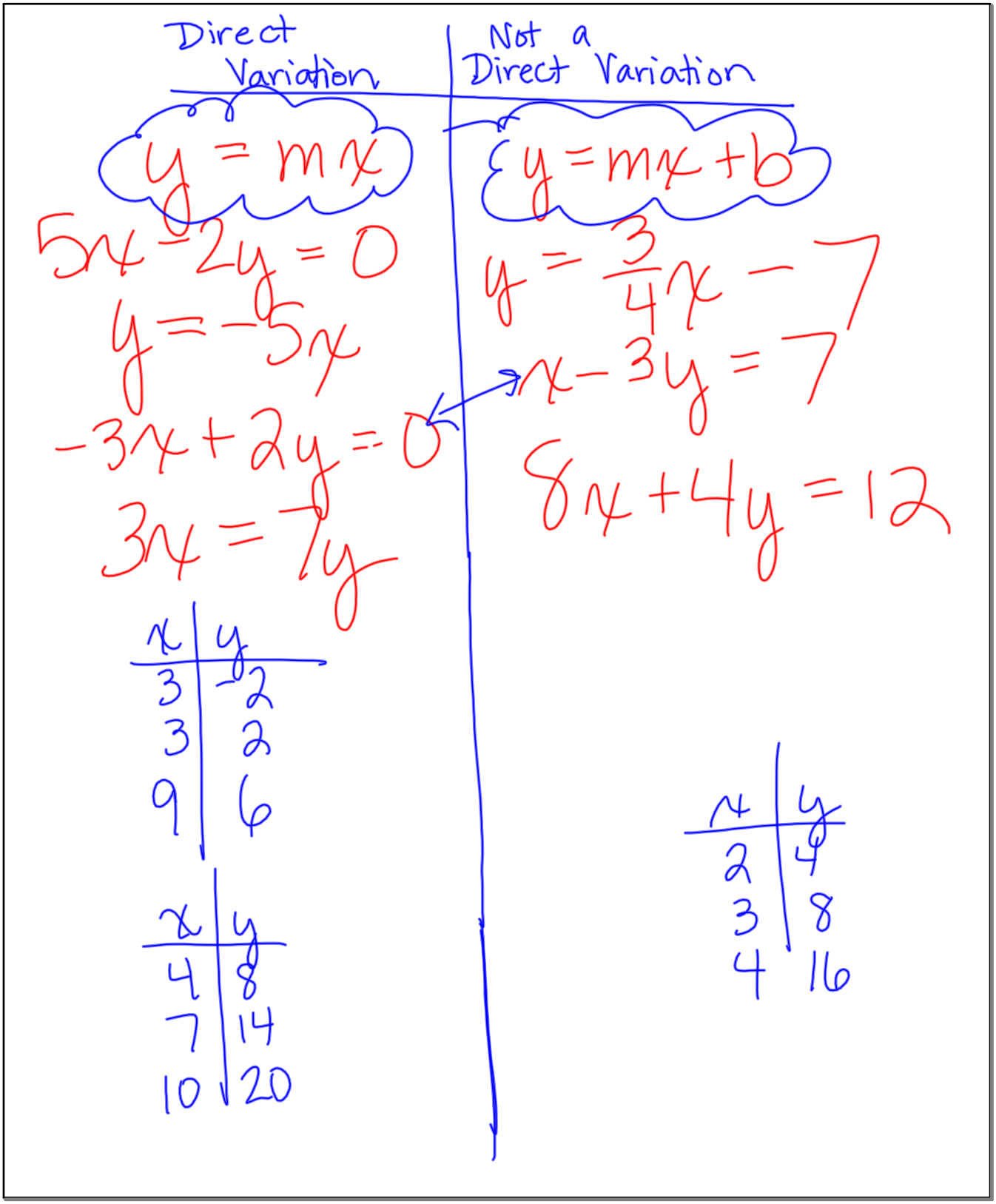
Direct Variation
Not a Direct Variation
y = mx
y = mx + b
5x − 2y = 0
y = −5x
−3x + 2y = 0
3x = 2y
y = 3/4x − 7
x − 3y = 7
8x + 4y = 12
x | y
3 | 2
3 | 2
9 | 6
x | y
4 | 8
7 | 14
10 | 20
x | y
2 | 4
3 | 8
4 | 16

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Problems 5.2

① $\frac{2y}{2} = \frac{3x}{2} + \frac{1}{2}$ Is this D.V.?

$y = \frac{3}{2}x + \frac{1}{2}$ NO, $b = \frac{1}{2}$, not 0

② y varies directly with x.
Write a direct variation equation.
Find the value of y when $x = 10$.
$y = 9$ when $x = 5$ $m = \frac{y}{x} = \frac{9}{5}$

$y = mx$

$\frac{9}{5} = \frac{m5}{5}$

$\frac{9}{5} = m$

$y = \frac{9}{5}x$

$x = 10$, $y = \frac{9}{\cancel{5}_1} \cdot \frac{\cancel{10}^2}{1} = 18$

18

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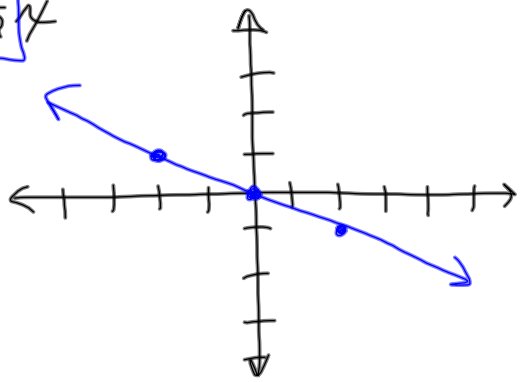
Notes

Problem 3:

Graph $y = \boxed{-\frac{1}{2}}x$ (m)

x	y
-2	$+1$

$-\frac{1}{2}(-2)$



Problem 4:

Suppose \$15 (US) is worth about \$150 Mexican Pesos.

a. What is an equation that relates US dollars x to Mexican pesos y?

$y = mx$

$\frac{150}{15} = \frac{m \cdot 15}{15}$

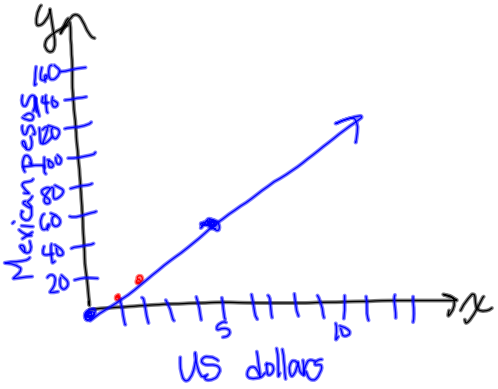
$10 = m$

$m = \frac{y}{x} = \frac{150}{15}$

$m = 10$

$\boxed{y = 10x}$ $m = \frac{10}{1}$

b. What is the graph of this equation?



x	$y = 10x$
5	50

$10 \cdot 5$

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Problem 5

Do these quantities vary directly?

a. the number of ounces of cereal and the number of Calories the cereal contains

Yes, as the number of ounces increases, the number of Calories increases. When one is 0, the other is 0.

b. the amount of money you have left and the number of items you purchase

As the number of items you purchase increases, the amount of money you have decreases.

No (inverse variation)

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Sec. 5.3 Slope-Intercept Form

Slope-Intercept Form

$$y = mx + b$$

m: slope; b: y-intercept

Problem 1:

What are the slope and y-intercept of the graph of

$$y = 3x - 6$$

slope: 3

y-intercept: -6

Problem 2:

What is an equation of the line with slope 5 and y-intercept 8?

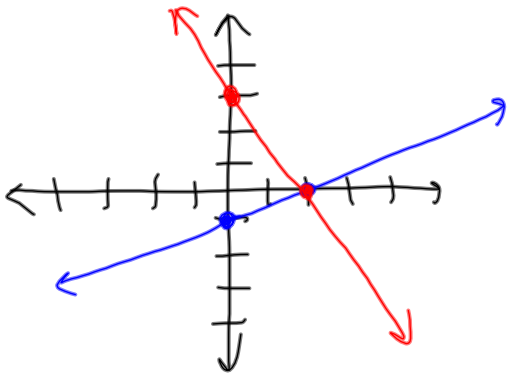
$m = 5$, $b = 8$

$$y = mx + b$$

$$y = 5x + 8$$

Problem 3:

What is the equation of the line?



$$y = mx + b$$

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

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

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Problem 4:

What is an equation in slope-intercept form of the line that passes through the points that follow?

a. $(1, -6)$ and $(-3, 10)$

$y = mx + b \rightarrow y = -4x + b$

① Find slope $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10 - -6}{-3 - 1} = \frac{10+6}{-4} = \frac{16}{-4}$

$m = -4$

② Find b.
- Pick ONE point
- Plug it in for x and y
- Plug in m.
- Solve for b.

$(\overset{x}{1}, \overset{y}{-6})$

$y = -4x + b$

$-6 = -4(1) + b$

$-6 = -4 + b$

$+4 \quad +4$

$-2 = b$

③ Write the equation, plugging in m + b.

$m = -4 \quad b = -2$

$\boxed{y = -4x - 2}$

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b. $(3, -2)$ and $(1, -3)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-(-2)}{1-3} = \frac{-3+2}{-2} = \frac{-1}{-2}$$

$m = \frac{1}{2} \rightarrow y = \frac{1}{2}x + b$

$(\overset{x}{3}, \overset{y}{-2})$

$-2 = \frac{1}{2}(3) + b$

$-2 = 1\frac{1}{2} + b$

$-1\frac{1}{2} \quad -1\frac{1}{2}$

$-\frac{7}{2}$ or $-3\frac{1}{2} = b$

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

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

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c. $(2,1)$ and $(5,-8)$

$$m = \frac{-8-1}{5-2} = \frac{-9}{3} = -3$$

$y = -3x + b$ → $\boxed{y = -3x + 7}$

(x, y)

$(2,1)$ $1 = -3(2) + b$

$1 = -6 + b$

$+6 \quad +6$

$7 = b$

d. $(-2,4)$ and $(3,-1)$

$$m = \frac{-1-4}{3+2} = \frac{-5}{5} = -1$$

$y = -x + b$

$(-2,4)$ $4 = -(-2) + b$

$4 = 2 + b$

$-2 \quad -2$

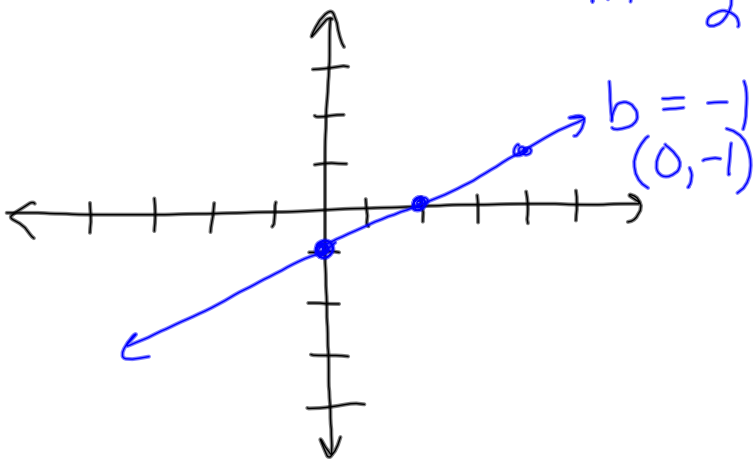
$2 = b$

$\boxed{y = -1x + 2}$

Problem 5:

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

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



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