

Algebra 2 Notes

Name Key

Unit 0 0.5 Find Slope and Rate of Change; Graph Lines

Slope:

* the ratio of the change in vertical to the change in horizontal units

$$\frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} \quad * m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{or} \quad \frac{y_1 - y_2}{x_1 - x_2}$$

Find the following slopes given two coordinates:

1. $(3, 4)$ $(-6, -8)$ $m = 4/3$ x_1, y_1 x_2, y_2 $\frac{-8-4}{-6-3}$	2. $(-2, -5)$ $(3, -2)$ $m = 3/5$ $\frac{-2-(-5)}{3-(-2)}$
3. $(-8, 0)$ $(-1, -1)$ $m = -1/7$ $\frac{-1-0}{-1-(-8)}$	4. $(5, 3)$ $(6, 2)$ $m = -1$ $\frac{2-3}{6-5}$
5. $(4, 5)$ $(4, 0)$ $m = \text{Undefined}$ $\frac{0-5}{4-4}$ DNE	6. $(-3, 2)$ $(1, 2)$ $m = 0$ $\frac{2-2}{1-(-3)}$

positive slopes: rise to the right	negative slopes: fall to the right
undefined slopes: no run vertical line $x = \text{---}$	zero slopes: no rise horizontal line $y = \text{---}$

Parallel lines: have the same slope	Perpendicular Lines: have opposite sign reciprocal slopes. $-1/5$ and $-5/1$
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Slope-intercept Form of a Line: $y = mx + b$	*m = slope	*b = y intercept $(0, b)$
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Find the slope of each line:

put in $mx + b$ form

1. $2x + 3y = 30$ $-2x$ $-2x$ $\frac{3y}{3} = \frac{-2x+30}{3} \Rightarrow y = -2/3x + 10$	$m = -2/3$
2. $y = 5$ $0x + 5$ horizontal line	$m = 0$

Determine the value of r so that a line with the given slope contains the given points:

3. $(5, r) (2, 3) m = 2$

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

$$2 = \frac{3 - r}{2 - 5}$$

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

$$\frac{2}{1} = \frac{3 - r}{-3} \quad \text{proportion}$$

$$\frac{-6}{-3} = \frac{3 - r}{-3}$$

$$\frac{-r}{-3} = \frac{-9}{-3}$$

4. $(r, 6) (3, 9) m = \frac{3}{5}$

$$\frac{3}{5} = \frac{9 - 6}{3 - r}$$

$$\frac{3}{5} = \frac{3}{3 - r}$$

$$3(3 - r) = 15$$

$$9 - 3r = 15$$

$$-9 - 3r = 6$$

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

Don't forget to distribute

Graph a line given the following conditions:

5. thru $(-2, 2)$ parallel to $3x + 2y = 8$

plot Find $m \rightarrow$

$$3x + 2y = 8$$

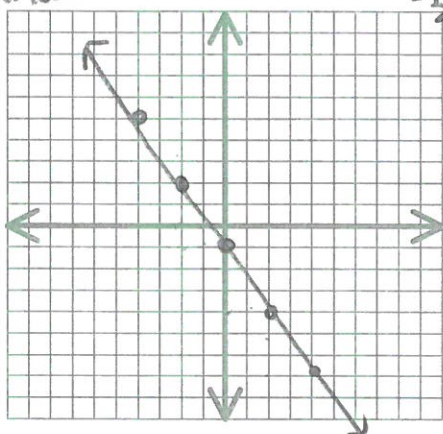
$$2y = -3x + 8$$

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

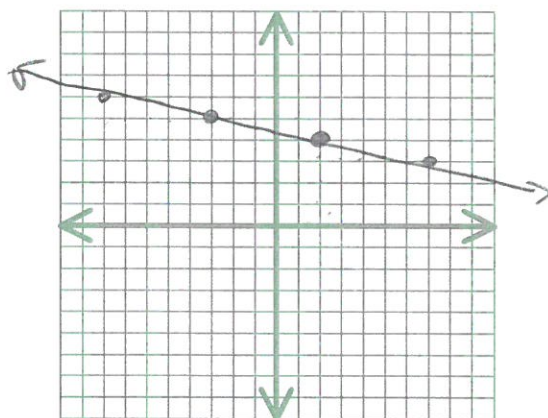
$$y = -\frac{3}{2}x + 4$$

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

same slope



6. $m = -\frac{1}{5}$ thru $(2, 4)$



7. thru origin perpendicular to $x + 2y = 4$

opp. recip.

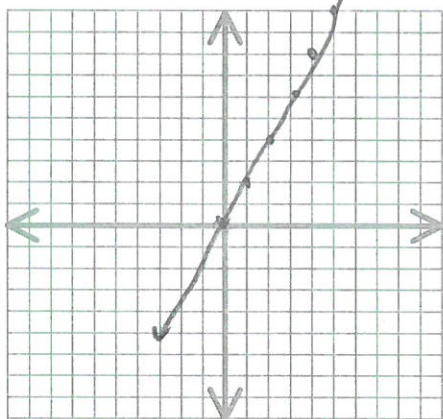
$$x + 2y = 4$$

$$2y = -x + 4$$

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

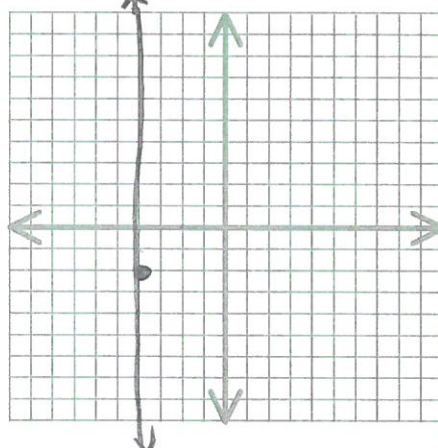
$$y = -\frac{1}{2}x + 2$$

$$\perp m = 2$$



8. $m = \text{undefined}$ thru $(-4, -2)$

vertical



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Graph Equations of Lines

Linear Equation: An equation whose graph is a line. It may have one or two variables with real number coefficients, being added/subtracted, with no variable having an exponent other than 1.

Examples

$$5x - 3y = 7$$

$$d = 10$$

$$8a = \frac{1}{2}b - 2$$

Non-Examples

$$\frac{2x}{y} = 10$$

variables are not being + or -

$$x^2 + y = 5$$

exponent is not 1

$$y = x^3$$

exponent is not 1

To Graph using x- and y-intercepts:

example: $2x - 3y = -6$

1. Find: **x-intercept**- Where the line crosses the x-axis

$$2x - 3(0) = -6 \quad (x, 0)$$

$$2x - 0 = -6$$

$$2x = -6 \quad (-3, 0)$$

$$x = -3$$

2. Find: **y-intercept**- Where the line crosses the y-axis

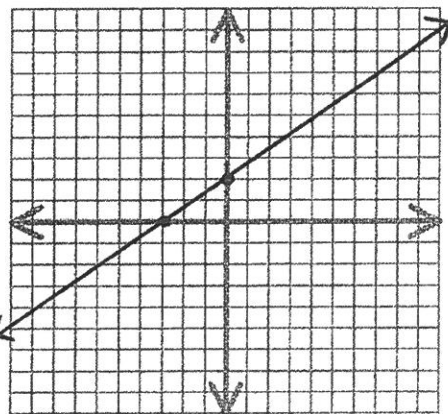
$$2(0) - 3y = -6 \quad (0, y)$$

$$0 - 3y = -6$$

$$-3y = -6 \quad (0, 2)$$

$$y = 2$$

3. Plot x- and y-intercepts. Connect the two points with a line.



To Graph using Slope-Intercept Form: $y = mx + b$

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

$$-4\left(-\frac{1}{4}y\right) = \left(\frac{1}{2}x + 1\right)(-4)$$

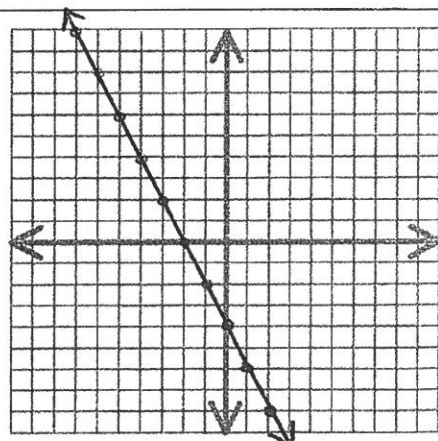
$$y = -2x - 4$$

1. Solve equation for y

2. Plot the y-intercept at $(0, b)$ $(0, -4)$

3. Plot other points using slope- m $m = -\frac{2}{1}$ or $m = \frac{2}{-1}$

4. Connect the points with a line.



OR... make a table of ordered pairs (inputs and outputs)

X/Y

Choose a method to graph the following. State the x- and y-intercepts for each.

$$1. \quad \begin{array}{r} y - x = 6 \\ +x \quad +x \\ \hline y = x + 6 \end{array}$$

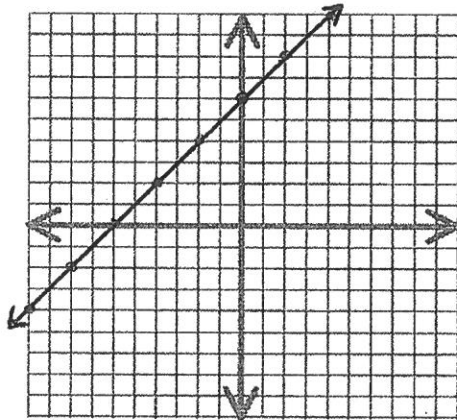
$$y - x = 6$$

$$x\text{-int: } (-6, 0)$$

$$(0) - x = 6$$

$$-x = 6$$

$$x = -6$$



$$y\text{-int: } (0, 6)$$

$$y - (0) = 6$$

$$y = 6$$

x-intercept: $(-6, 0)$

y-intercept: $(0, 6)$

$$2. \quad 4x + 3y = 12$$

$$3y = -4x + 12$$

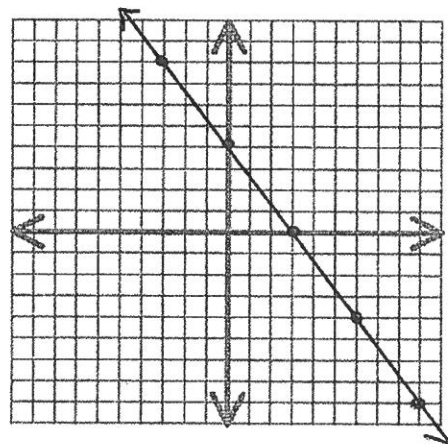
$$y = -\frac{4}{3}x + 4$$

$$x\text{-int: } (3, 0)$$

$$4x + 3(0) = 12$$

$$4x = 12$$

$$x = 3$$



$$y\text{-int: } (0, 4)$$

$$4(0) + 3y = 12$$

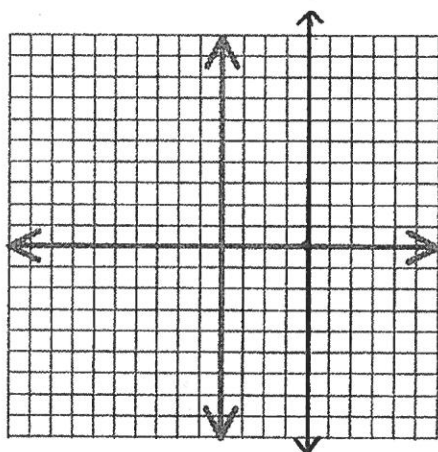
$$3y = 12$$

$$y = 4$$

x-intercept: $(3, 0)$

y-intercept: $(0, 4)$

$$3. \quad x = 4$$



x-intercept: $(4, 0)$

y-intercept: None

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

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

$$y = -8x - 2$$

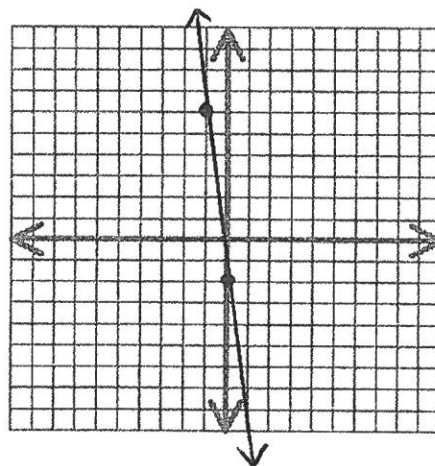
$$x\text{-int: } (-\frac{1}{4}, 0)$$

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

$$4x = 0 - 1$$

$$4x = -1$$

$$x = -\frac{1}{4}$$



$$y\text{-int: } (0, -2)$$

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

$$0 = -\frac{1}{2}y - 1$$

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

$$-2 = y$$

x-intercept: $(-\frac{1}{4}, 0)$

y-intercept: $(0, -2)$