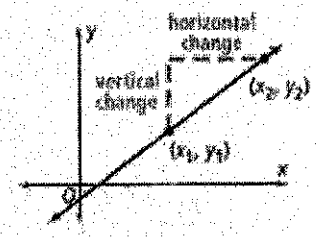
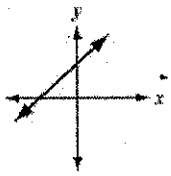
Notes #1

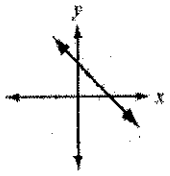
Linear Functions and Slope-Intercept form

Objective: To graph linear equations. To write equations of lines

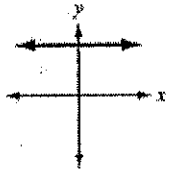
Word	Definition/Example
Slope	Slope is the ratio that compares the Vertical change to the Horizontal change.  **Slope Formula** $slope = \frac{vertical\ change (rise)}{horizontal\ change (run)} = \frac{y_2 - y_1}{x_2 - x_1}, where\ x_2 - x_1 \neq 0$



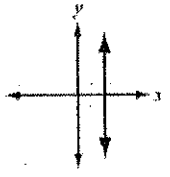
A line with a ***positive slope*** slants up to the right.



A line with a ***negative slope*** slants down to the right.



A line with a ***slope of 0*** is horizontal.



A line with an ***undefined slope*** is vertical.

Slope Formula

$$slope = \frac{vertical\ change (rise)}{horizontal\ change (run)} = \frac{y_2 - y_1}{x_2 - x_1}, where\ x_2 - x_1 \neq 0$$

Example 1)

Find the slope of the line that passes through the following pairs of points:

a) (3, 2) and (-9, 6)

$x_1\ y_1\ \ x_2\ y_2$

$m = \frac{6-2}{-9-3} = \frac{4}{-12} = -\frac{1}{3}$

b) (-3, 1) and (-4, 1)

$x\ y_1\ \ x_2\ y_2$

$m = \frac{1-1}{-4+3} = \frac{0}{-1} = 0$

$m = 0$

A **linear function** is a function whose graph is a line

A **linear equation** is used to represent a linear function, such as $y = mx + b$

The **y-intercept** of a line is the point at which the line crosses the y axis

The **x-intercept** of a line is the point at which the line crosses the x-axis

Slope-Intercept Form of a Line

y = mx + b

where m is the slope, and (0,b) is the y-intercept

Example 2) What is an equation of each line?

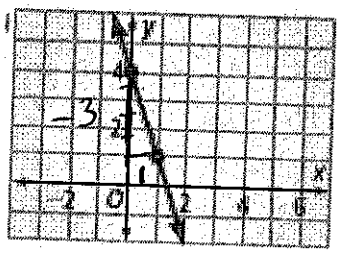
a) $m = \frac{1}{5}$ and the *y*-intercept is (0, -3)

b = -3

$y = mx + b$

Equation: $y = \frac{1}{5}x - 3$

b)



Equation: $y = -3x + 4$

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

$b = 4$

$y = mx + b$

Example 3) Write the equation in slope-intercept form. What are the slope and y-intercept?

a) $5x - 4y = 16$

$-5x \quad -5x$

$\frac{-4y}{-4} = \frac{16}{-4} + \frac{5x}{-4}$

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

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

Equation: $y = 5/4x - 4$

Slope(m): $5/4$

y-intercept (b): -4

Steps for Re-Writing Equation in Slope-Intercept Form.

1) Get y term alone. To do this remove the x-term by adding or subtracting it from both sides

2) Now solve for y. Divide every term on both sides by y's coefficient (the number in front of y)

3) Now rewrite as $y = mx + b$

b) $-\frac{3}{4}x + \frac{1}{2}y = -1$

$+\frac{3}{4}x \quad +\frac{3}{4}x$

$\frac{2}{1}\cdot\frac{1}{2}y = \frac{2}{1}(-1) + \frac{3}{4}x\left(\frac{2}{1}\right)$

$y = -2 + \frac{6}{4}x$

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

$b \quad m$

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

Slope(m): $3/2$

y-intercept (b): -2

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Example 4)
Graph $-2x + y = 1$

$+2x \quad +2x$

$y = 1 + 2x$

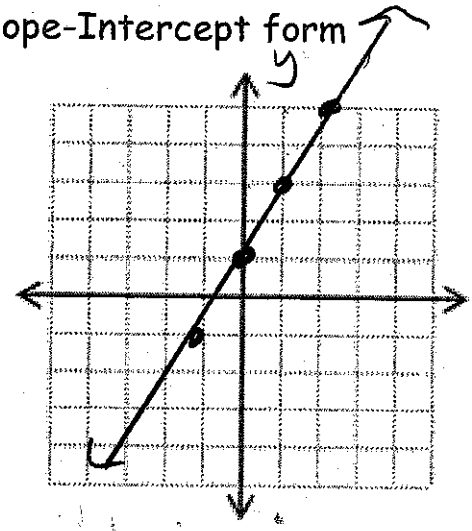
$y = 2x + 1$

$m = 2/1$ ↑ 2, → 1

$b = 1$

Steps for Graphing:

1) Rewrite equation in slope-intercept form if necessary
2) Identify slope (m) and y-intercept (b)
3) Plot y-intercept
4) Move the slope (rise/run) to find more points on the line

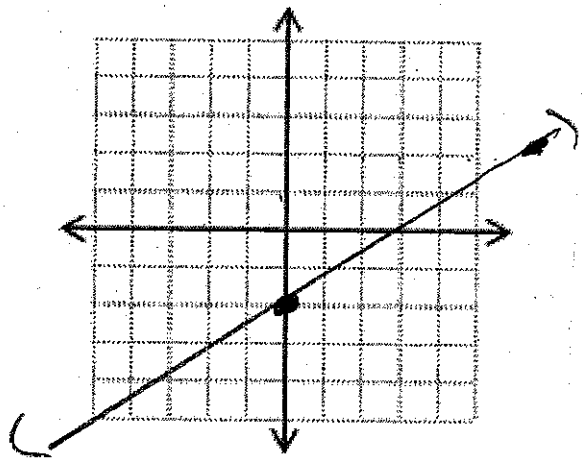


Graph $4x - 7y = 14$

$-4x \quad -4x$

$\frac{-7y}{-7} = \frac{14}{-7} + \frac{4x}{-7}$

$y = -2 + \frac{4}{7}x$

$m = 4/7$ ↑ 4, → 7

$b = -2$