

START OF REVIEW (not covered during lecture)

This is just a brief review of skills you already need to be familiar with. If you do not recall linear equations / linear functions as used in the examples below, work through chapter 3.2 – 3.5 (pages 194–226) in your book.

Linear Functions are of the form $y = mx + b$ (slope-intercept form) or $Ax + By = C$ (standard form)

Note: In standard form B and C are integers and A is a non-negative integer.

Example: $6x + 3y = 1$ is a linear equation in **standard form**.

Bring this linear equation in **slope-intercept** form and express it in **function notation**.

$$\begin{array}{r} 6x + 3y = 1 \\ -6x \qquad -6x \\ \hline 3y = -6x + 1 \\ \frac{3y}{3} = \frac{-6x}{3} + \frac{1}{3} \\ y = -2x + \frac{1}{3} \end{array}$$

The graph of a linear function is a straight line

Note: Functions that are linear only include x , but not terms like $x^2, x^3, x^4, \frac{1}{x}, \frac{1}{x^2}, \sqrt{x}, \sqrt[3]{x}, \dots$ etc.

To find the slope of a line, use the slope formula

The slope is defined as $m = \frac{\text{rise}}{\text{run}}$ and thus calculated $m = \frac{y_2 - y_1}{x_2 - x_1}$

The slope of a line is the incline, it expresses how steep the line is and whether it is rising or falling. A negative slope describes a decreasing line, a positive slope an increasing line.

Example: Calculate the slope of the line passing through $(-1, 4), (3, 2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 4}{3 - (-1)} = \frac{2 - 4}{3 + 1} = \frac{-2}{4} = -\frac{1}{2}$$

Example: Calculate the slope of the line passing through $(-7, -2), (-2, 1)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-2)}{-2 - (-7)} = \frac{1 + 2}{-2 + 7} = \frac{3}{5}$$

Graphing linear equations

To graph a line, we can use two given points, but usually we use the slope and the y -intercept.

Slope-Intercept Form $y = mx + b$
 $m =$ slope of the line
 $b =$ **y -intercept:** where the line intersects the y -axis

MAT 012 Review & Lecture Notes: ch 8, supplement A, Linear Functions

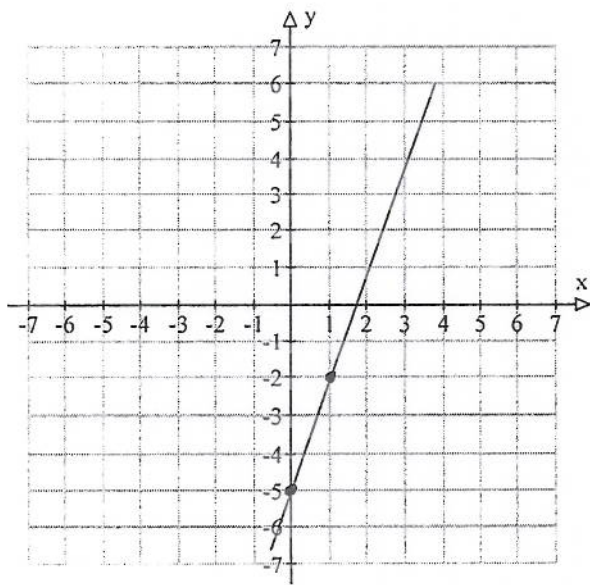
Example: Given $y = 3x - 5$

a) State the **slope**: $m = 3$
(label it with the variable name)

b) State the **y-intercept**: $b = -5$
(label it with the variable name)

same as $(0, -5)$
(state the point)

c) graph



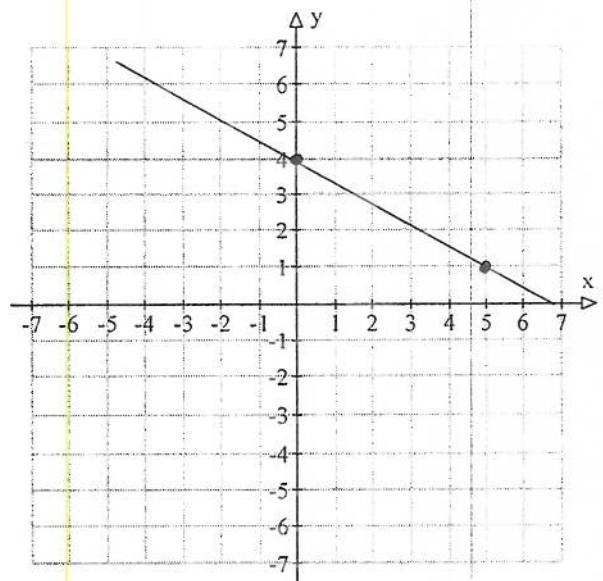
If you want to graph an equation given in **standard form**, convert the equation to slope intercept form (i.e. solve for y), then graph.

Example: Given $3x + 5y = 20$

Bring in slope-intercept form, then graph.

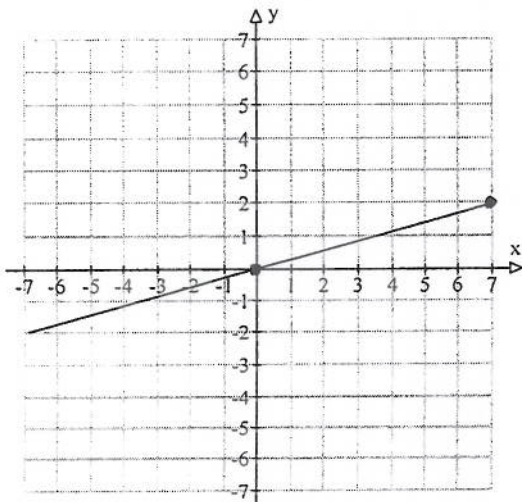
$$\begin{array}{r} 3x + 5y = 20 \\ -3x \quad -3x \\ \hline 5y = -3x + 20 \\ \frac{5y}{5} = \frac{-3x}{5} + \frac{20}{5} \end{array}$$

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

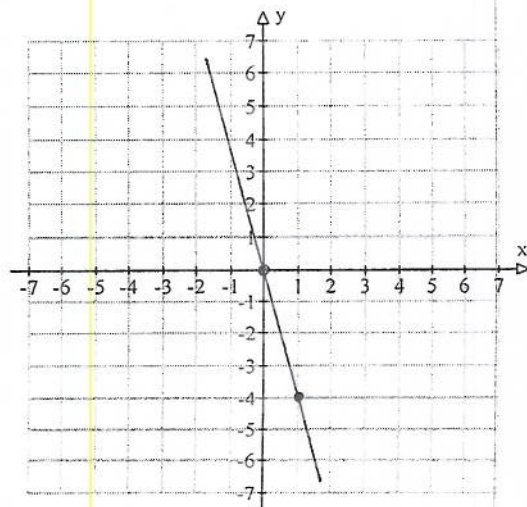


Graphs that pass through the origin

Example: $y = \frac{2}{7}x$



Example: $y = -4x$



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Find the equation of the line, given the slope and one point

Example: Find the slope-intercept equation of the line with a slope of 2 through the point $(-1, 3)$.

$$m = 2 \quad \text{point } (-1, 3)$$

$$y = mx + b$$

$$y = 2x + b$$

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

$$3 = -2 + b$$

$$\begin{array}{r} +2 \quad +2 \\ \hline 5 = b \end{array}$$

Don't forget to state the equation:

$$y = 2x + 5$$

Find the equation of the line, given two points

Example: A line is passing through the points $(x_1, y_1) = (-3, -6)$ and $(x_2, y_2) = (9, -2)$.

a) Calculate the slope of the line.

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

b) Find the equation of the line (*Using Algebra*)

$$y = mx + b \quad m = \frac{1}{3} \quad (x, y) = (-3, -6)$$

$$y = \frac{1}{3}x + b$$

$$-6 = \frac{1}{3} \cdot \frac{-3}{1} + b$$

$$-6 = -1 + b$$

$$\begin{array}{r} +1 \quad +1 \\ \hline -5 = b \end{array}$$

Don't forget to state the equation:

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

END OF REVIEW
