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 184– 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**.

$$6x + 3y = 1$$
$$-6x \qquad\qquad -6x$$
$$\frac{3y}{3} = \frac{-6x}{3} + \frac{1}{3}$$
$$y = -2x + \tfrac{1}{3}$$

The graph of a linear function is <u>a straight line</u>

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

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

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

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 $\overset{x_1 \ y_1}{(-1, 4)}, \overset{x_2 \ y_2}{(3, 2)}$

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

Example: Calculate the slope of the line passing through $\overset{x_1 \ y_1}{(-7, -2)}, \overset{x_2 \ y_2}{(-2, 1)}$

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

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
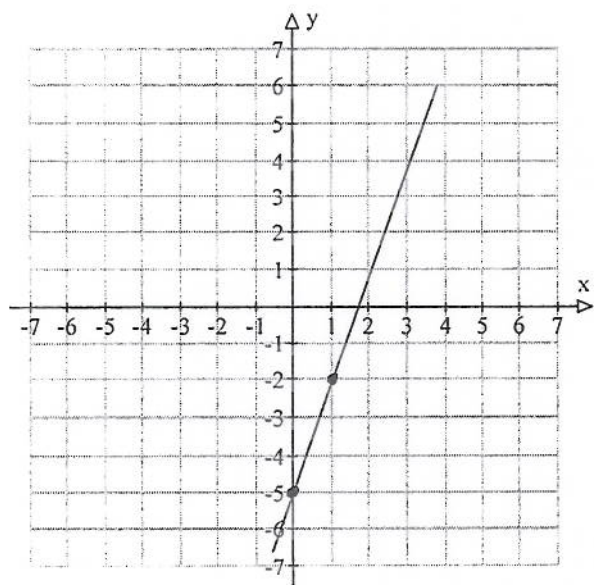
Example: Given $y = 3x - 5$

        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)
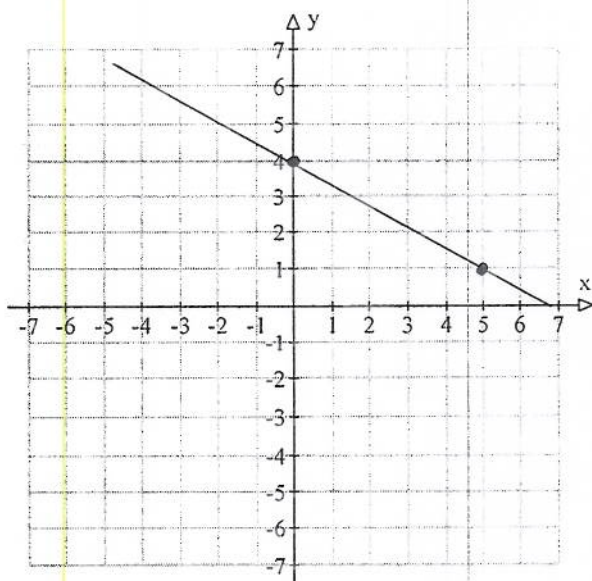
        c) graph

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 $3x + 5y = 20$

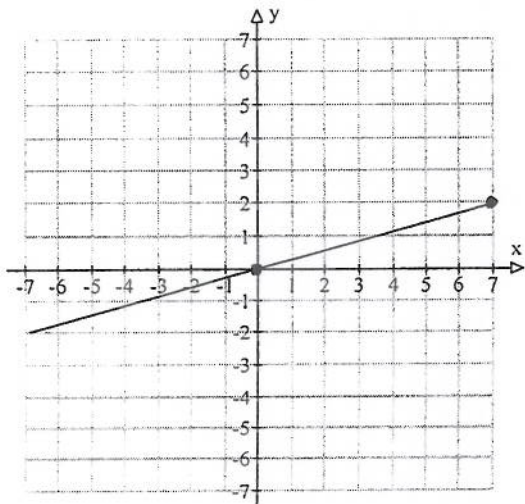   Bring in slope-intercept form, then graph.

$$3x + 5y = 20$$
$$\underline{-3x \qquad\qquad -3x}$$
$$\frac{5y}{5} = \frac{-3x}{5} + \frac{20}{5}$$
$$y = -\frac{3}{5}x + 4$$

Graphs that pass through the origin

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

Example: $y = -4x$
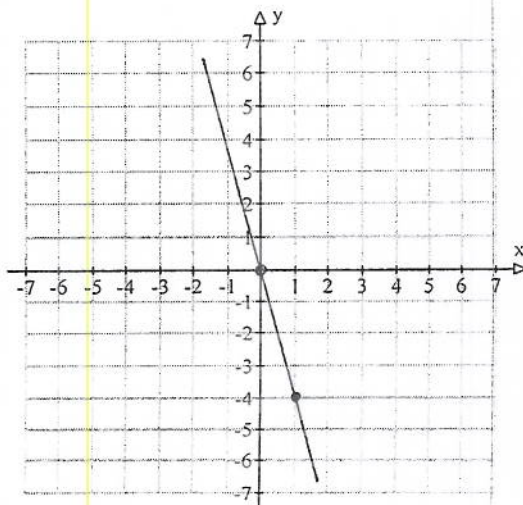
Find the equation of the line, given the slope and one point

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

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

$$y = mx + b$$
$$y = 2x + b$$
$$3 = 2(-1) + b$$
$$3 = -2 + b$$
$$\underline{+2 \qquad +2}$$
$$5 = b$$

Don't forget to state the equation:

$$\boxed{y = 2x + 5}$$

Find the equation of the line, given two points

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

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*)

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

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

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

$$-6 = -1 + b$$
$$\underline{+1 \qquad +1}$$
$$-5 = b$$

Don't forget to state the equation:

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

END OF REVIEW

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