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

**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 <u>not</u> recall linear equations / linear functions** as used in the examples below, <u>work through</u> 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)

<u>Note</u>: 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**.

The graph of a linear function is _____

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

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

The slope is defined as $m = \frac{rise}{run}$ 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)

*Example*: Calculate the slope of the line passing through (–7, –2), (–2, 1)

### 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**: _____
(label it with the variable name)

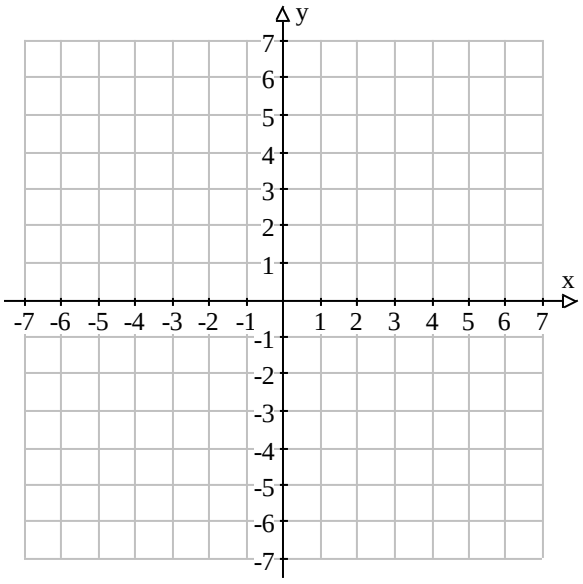
b) State the ***y*-intercept**: _____
(label it with the variable name)

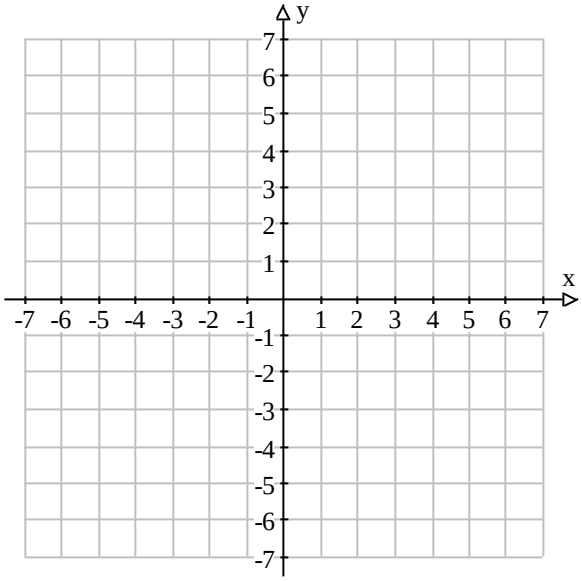
same as _____
(state the point)

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.

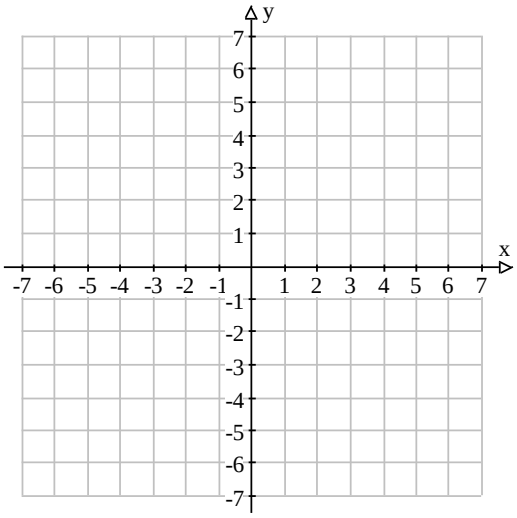
*Example*: Given $3x + 5y = 20$
Bring in slope-intercept form, then graph.



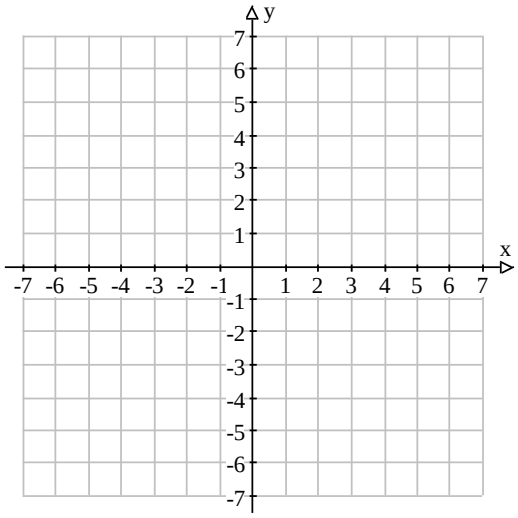




## Graphs that pass through the origin

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




*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 ).

Don't forget to state the equation: [ ]

## 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.

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

Don't forget to state the equation: [ ]

**END OF REVIEW**

**(Solutions to this Review will be posted on http://ola4.aacc.edu/sclayton1 .)**

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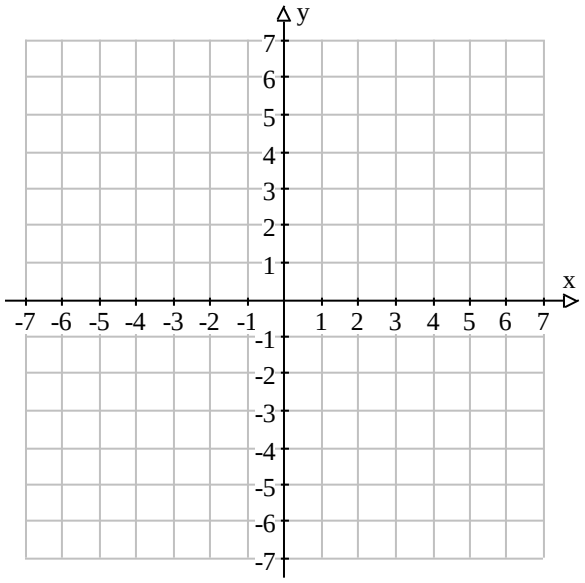
**If you want to graph an equation given in standard form**, convert the equation to slope intercept form (i.e. solve for *y*), then graph.

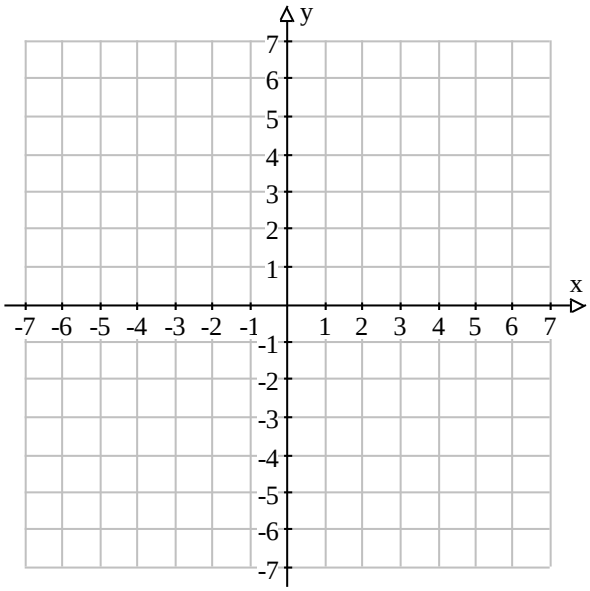
*Example*: $-2x + 3y = -9$

Bring in slope-intercept form, then graph.

*Example*: $-4x - 2y = -2$

Bring in slope-intercept form, then graph.




### Intercepts

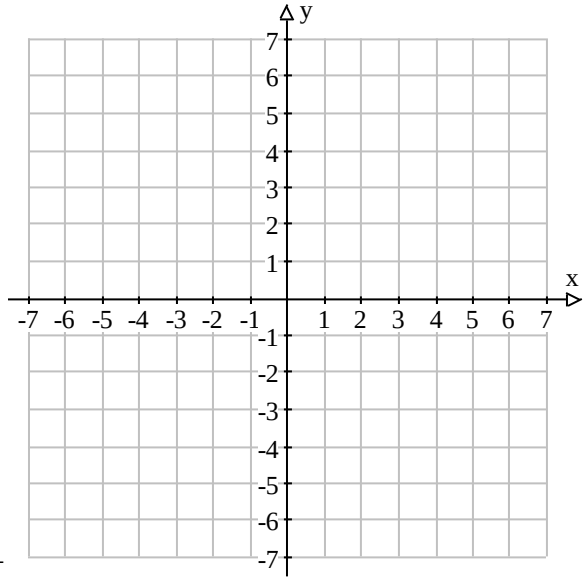
Sometimes, we pick the *x*-intercept and the *y*-intercept as two points from which to graph the line:

| |
|---|
| ***x*-intercept: Let *y* = 0,** solve for *x*. |
| ***y*-intercept: Let *x* = 0**, solve for *y*. |

*Example*: Find the intercepts and graph $2y - x = 6$

***x*-intercept**:
(give the point)

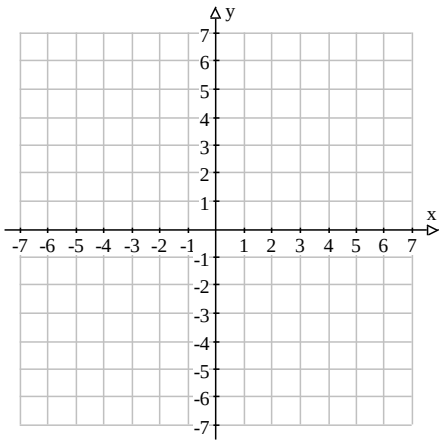
***y*-intercept**:
(give the point)



**Special Cases**:

| $x$ = number |
|---|

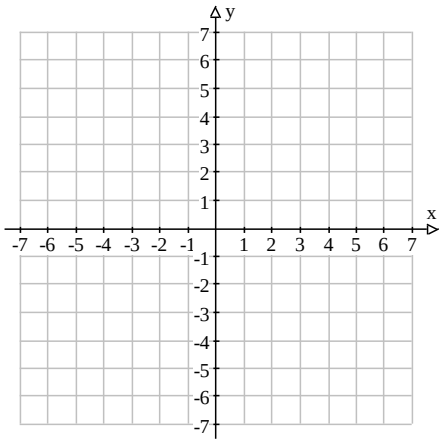
*Example*: $x = -3$




This graph is a _____line.

| $y$ = number |
|---|

*Example*: $y = 5$




This graph is a _____line.

## Find the equation of the line, given two points (slope intercept form)

*Example*: A line is passing through the points ( –3, 5 ) and ( 3, 1 ).

a) Calculate the slope of the line.

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

Don't forget to state the equation:

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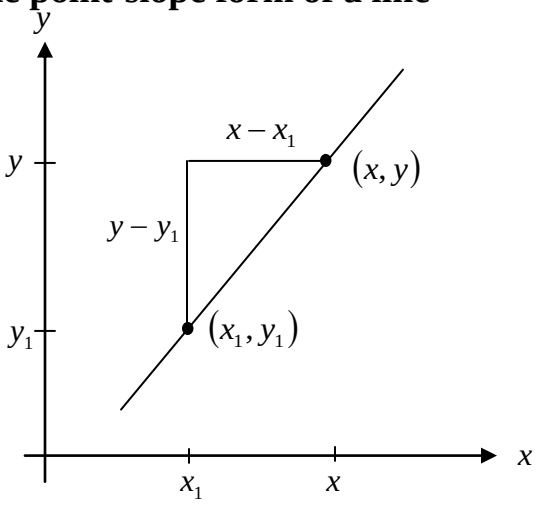
## The point-slope form of a line




In this figure: $\frac{rise}{run} = \frac{y - y_1}{x - x_1} = m$

If we multiply the equation

$$\frac{y - y_1}{x - x_1} = m$$

by $(x - x_1)$ on both sides,
we obtain the point-slope form of the line

$$y - y_1 = m(x - x_1)$$

**Point-Slope Form** of a line: $y - y_1 = m(x - x_1)$

The point-slope form of the line can be set-up as long as *m* is known or can be found and one point on the line is known.
The point-slope form of the line can be simplified into the slope-intercept form $y = mx + b$.
(Distribute the *m* on the right hand side and bring the constant over to the other side.)

*Example*: A line is going through the points (– 4, 9) and ( –1 , – 3 ).

a) Caluclate the slope of the line.

b) Set up an equation of the line in **point-slope form**

c) Bring the equation in slope intercept form.