Algebra2
Lesson 2-2: Linear Equations
Mrs. Snow, Instructor

In Algebra I we discovered that a function is considered to be linear if the independent variable increases or decreases at a constant rate. Graphically, a function that graphs out to be a line is a linear function.

Vocabulary

x – This is the independent variable and is graphed on the horizontal axis.

y – This is the dependent variable and is the output of the function resulting when an x-value is put into the linear equation.

x-intercept – The location where a line crosses the x-axis.

y-intercept – The location where a line crosses the y-axis.

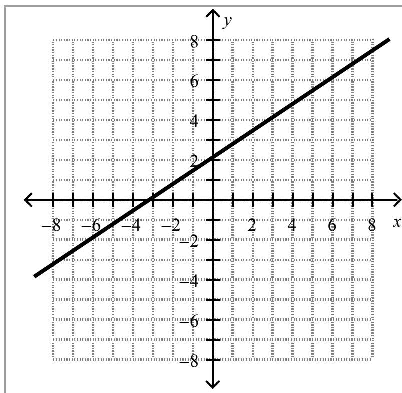
Linear equations

1. Standard Form: $Ax + By = C$
2. Slope-Intercept Form: $y = mx + b$
3. Point-Slope Form: $y - y_1 = m(x - x_1)$
4. Slope of a line: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{rise}{run}$

Remember!!: y-intercept has the form (0,y) x-intercept has the form (x,0)

Example:

state the x and y intercepts for the graph at the right.



rate of change – the measure of the steepness of the line. It is ratio of the vertical change over the horizontal change between two points. The rate of change is also called the **slope**:

$$rate\ of\ change = \boldsymbol{slope} = \boldsymbol{m} = \frac{change\ in\ f(x)}{change\ in\ x} = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{\boldsymbol{rise}}{\boldsymbol{run}} = \frac{\boldsymbol{y_2 - y_1}}{\boldsymbol{x_2 - x_1}}$$

Example: Does the xy table have a constant rate of change? Does the table model a linear function? Check all the points!

x	0	2	4	6	8
f(x)	-2	0	6	16	30

x	0	2	3	5	6
y	3	7	9	13	15

What is the slope of a line passing through the points $(0, -3) and\ (7, -9)$

Point-Slope Formula

A line passing through point (x_1, y_1) with a slope m has the equation:

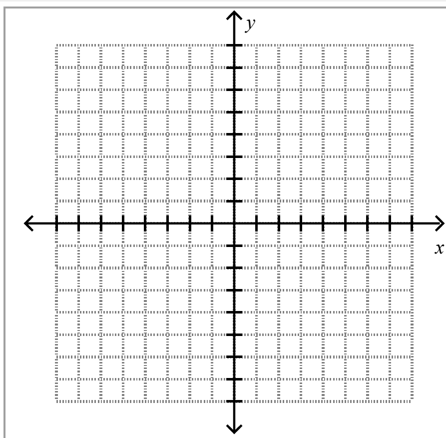
$$y - y_1 = m(x - x_1)$$

Write in standard form the equation of each line: slope 2, through $(4, -2)$	Write in point slope form the equation of the line that passes through the points $(5, 1) and (-4, -3)$

Graphing given a point and a slope

A slope makes graphing a line from a given point very easy.

Graph a line through (-1,-2) with a slope of $\frac{2}{3}$.



Slope-Intercept Form

Combining the ideas about slope and intercept lead to a general equation form for a line called the slope-intercept form: y=mx+b, where m is the slope and b is the y-intercept. The slope-intercept form allows one to graph almost any linear equation in just a few seconds WITHOUT the use of a graphing calculator

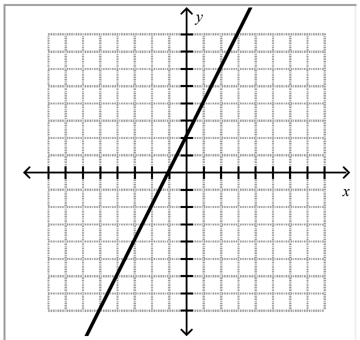
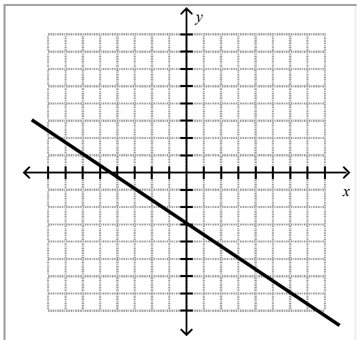
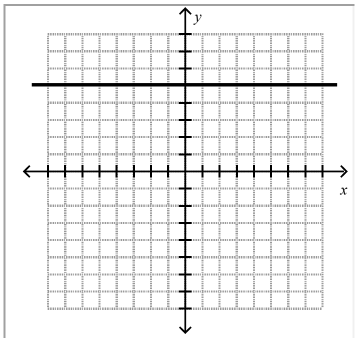
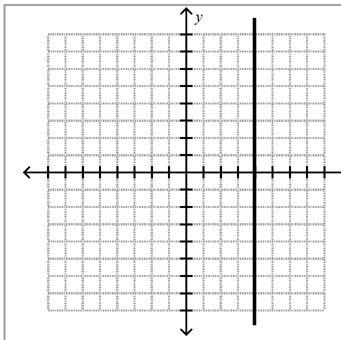
y-intercept

$$y = mx + b$$

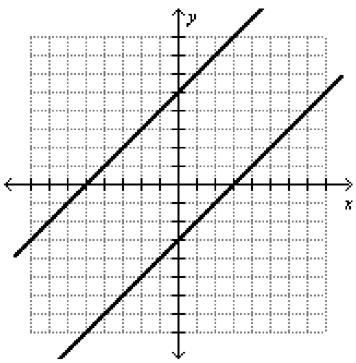
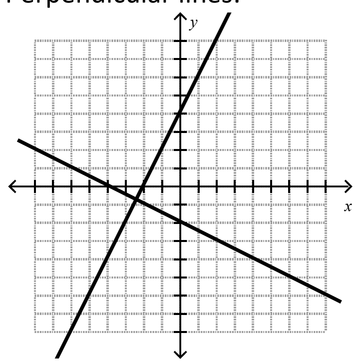
slope

Find the slope using slope-intercept form: $3x + 2y = 1$	$Ax + By = C$

We need to readily recognize whether the sign of the slope is positive or negative or something else!

Relationship between special linear systems and their slopes

Parallel lines: 	Perpendicular lines: 

We are able to find an equation of a line passing through a point and perpendicular to another line if we are given the reference line and the point. Also, we can find a line parallel to another if given the same information.

$(-1, 3)$ *and perpendicular to the line* $y = 5x - 3$	$(2, 1)$*and parallel to the line* $y = \frac{2}{3}x + \frac{5}{8}$