Algebra II – Chapter 2

2.1: Represent Relations and Functions

Relation – a pairing of input values with output values (You put something in, you get something out.)

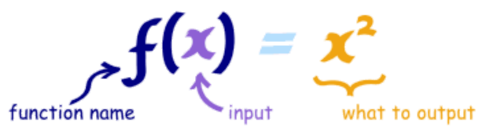
Domain – the input (what you put in)

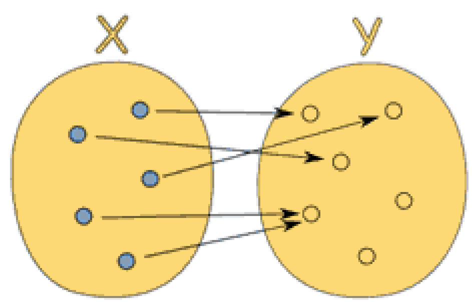
Range – the output (what you get out)

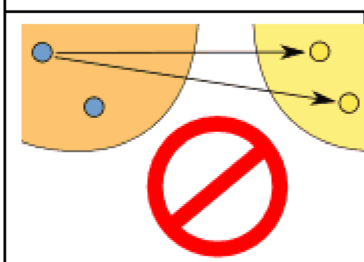
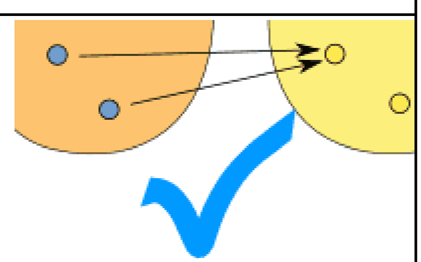
Function – a relation where each input has *exactly* one output

Linear function in x-y notation: $y = mx + b$

Linear function in function notation: $f(x) = mx + b$



	Formal Definition of a Function A function relates **each element** of a set with **exactly one** element of another set (possibly the same set).

Note: "One-to-many" is **not** allowed, but "many-to-one" is allowed:		
		
(one-to-many)		(many-to-one)
This is **NOT** OK in a function		But this **is** OK in a function

When a relationship does **not** follow those two rules then it is **not a function** ... it is still a **relationship**, just not a function.

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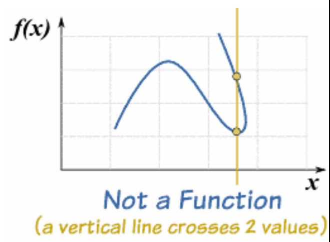
<td>
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<td>Vertical Line Test

On a graph, the idea of single valued means that no vertical line ever crosses more than one value.

If it crosses more than once it is still a valid curve, but is not a function.</td>
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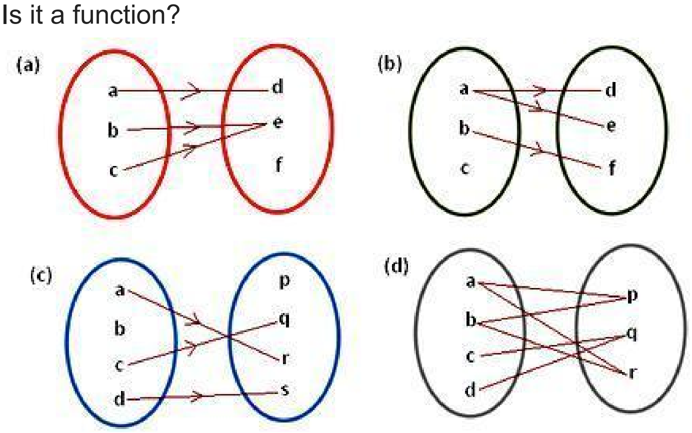
<u>Practice</u>:

1) ID the domain and range. Graph and map.
   (5, -2), (-3, -2), (3, 3), (-1, -1)

2) Is it a function?

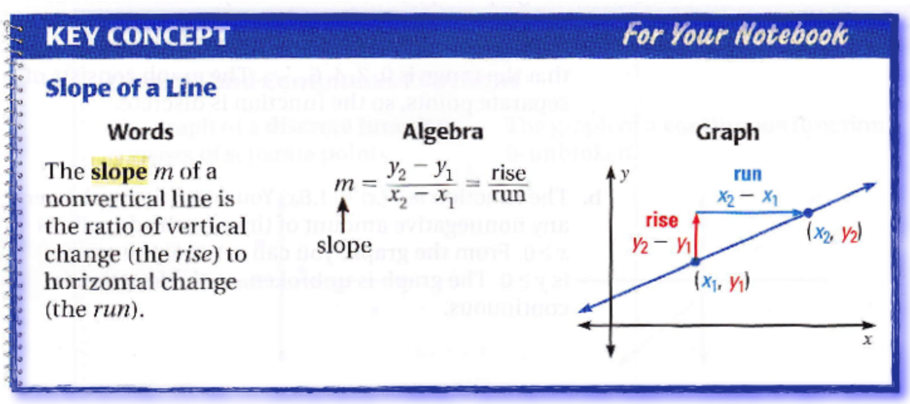


3) Graph: $y = 5x - 3$

4) Tell whether the function is linear or not. Then evaluate the function for the given value of x.

$$f(x) = x^3 - 2x^2 + 5x - 8;\ f(-5)$$

2.2: Find Slope and Rate of Change



KEY CONCEPT — *For Your Notebook*

Slope of a Line

Words: The **slope** m of a nonvertical line is the ratio of vertical change (the *rise*) to horizontal change (the *run*).

Algebra: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$ (slope)

Graph

Positive (rising) slope – when m is positive

Negative (falling) slope – when m is negative

Horizontal slope – when m is 1

Vertical slope – when m is undefined (denominator is 0)

Parallel lines – have equal slope $(m_1 = m_2)$

Perpendicular lines – slopes are negative reciprocals $(m_1 = -\frac{1}{m_2})$

<u>Practice</u>:

1) Find the slope. Tell if it rises, falls, is horizontal or vertical
   a) (-5, 1), (3, 1)

   b) (-6, 0), (2, -4)

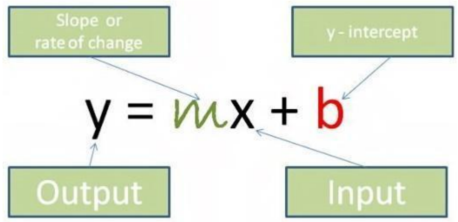
2) Tell if the lines are parallel, perpendicular, or neither
   - Line 1: Through (3, -1), (6, -4)
   - Line 2: Through (-4, 5), (-2, 7)

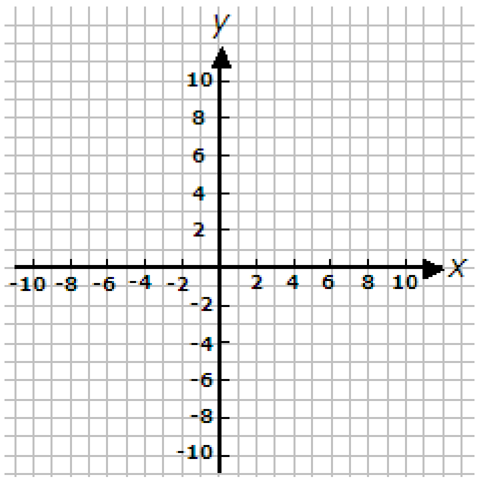
3) Find the rate of change (which is like slope)
   - (2, 12), (5, 30) – x is measures in hours and y is measured in dollars

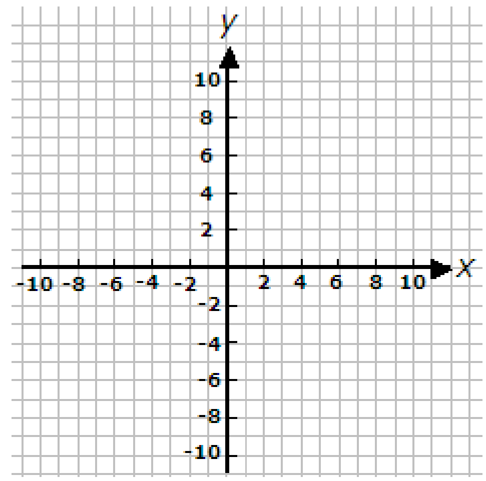
4) Find the slope of the line passing through the given points
   - $\left(-\frac{3}{4}, -2\right), \left(\frac{5}{4}, -3\right)$

- **2.3: Graphing Equations of Lines**

Graph $y = x,\ \ y = 3x,\ \ y = x + 4$ and compare.

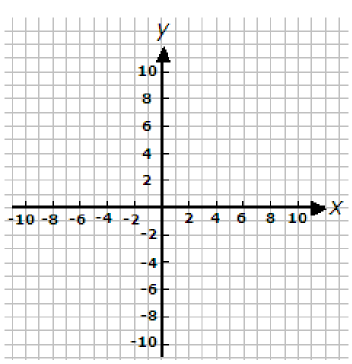


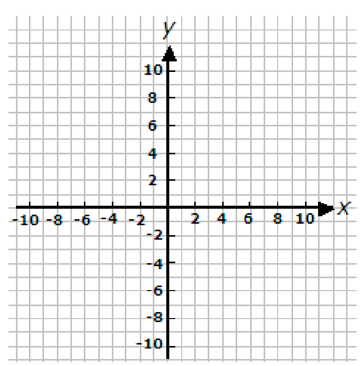


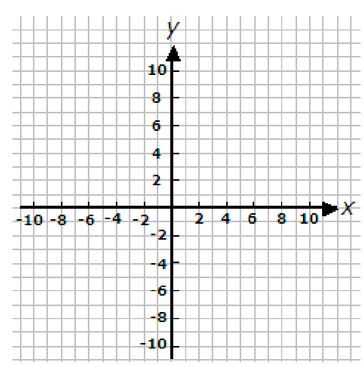


Graph:

$a) y = x - 2 \quad b) x = 4 \quad c) y = 3 \quad d) y = 2x - 1 \quad e) y = \frac{3}{2}x - 2 \quad f) - 6x + 8y =- 36$







2.4: Write Equations of Lines

Writing an Equation of a Line

Given	**What to use**
Slope (m) and y-intercept (b)	$y = mx + b$
Slope (m) and one point (x_1, y_1)	Use point-slope form: $y - y_1 = m(x - x_1)$
Two points (x_1, y_1) and (x_2, y_2)	First – use the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ Then – use point-slope form: $y - y_1 = m(x - x_1)$

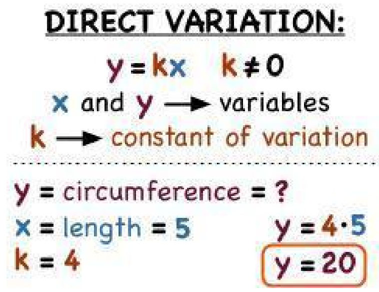
Practice:

1) Write an equation of a line that has a slope $m = -\frac{3}{4}$, $b = \frac{7}{2}$

2) Write an equation of the line that passes through $(4, 2)$ and is (a) parallel to and (b) perpendicular to the line $y = 3x - 1$

3) Write an equation that passes through the given points $(6, 1)$, $(-3, -8)$

2.5: Model Direct Variation



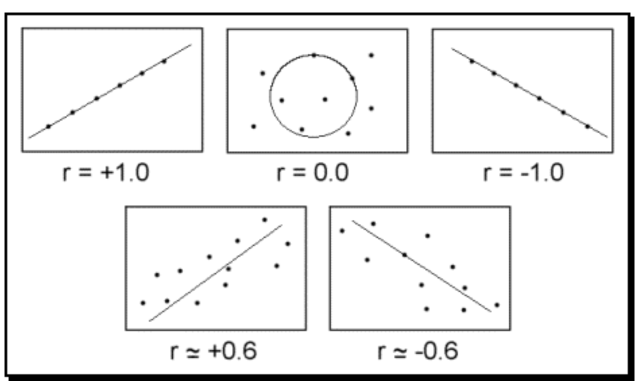
1) Write and graph a direct variation that has the ordered pair as a solution
   a. $(3, \ -9)$

   b. $(5, 3)$

2) x and y vary directly. Write an equation and then find x when $y = -4$. $x = 5$, $y = -15$

2.6: Draw Scatter Plots and Best Fitting Line

A scatter plot is a series of points plotted on the coordinate plane. We can determine if there is correlation with the points by looking at the graph. The correlation is measured by the correlation coefficient, r, which ranges from -1 to 1. Here are some examples:



A positive r value is considered a positive correlation; a negative is a negative correlation.

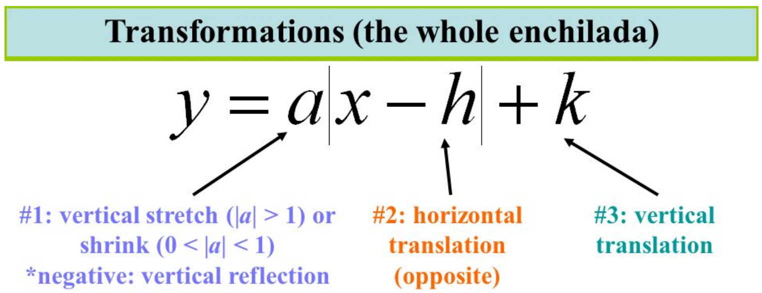
Look at #4, #8

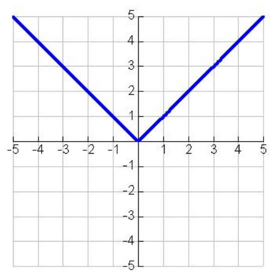
1) Draw a scatter plot of the data, approximate the best fit line, and estimate y when x=20.

x	12	25	36	50	64
y	100	75	52	26	9

2.7: Use Absolute Value Functions and Transformations

We learned about absolute values, now we will look at their graphs. The standard graph of $y = |x|$





Parent function $y = |x|$

Key points (-1, 1), (0, 0), (1, 1)

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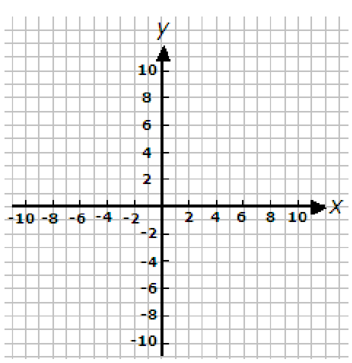
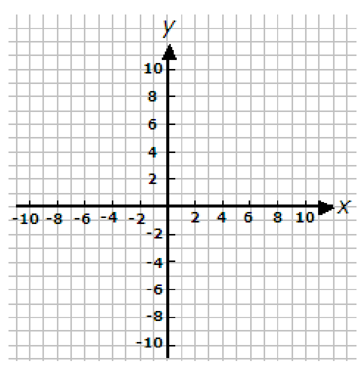
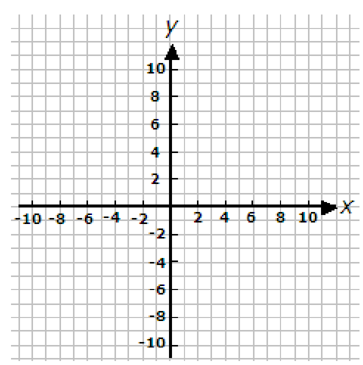
Practice:

1) Graph $y = |x - 2| + 5$
2) Graph $y = \frac{1}{4}|x|$
3) Graph $f(x) =- 3|x + 1| - 2$







2.8: Graph Linear Inequalities in Two Variables

Graph the inequality on a coordinate plane:

1) $x \geq 6$
2) $-2y \leq 8$
3) $2x + 5y < -10$
4) $y > |x + 4| - 3$
5) $y < 3|x| + 2$