

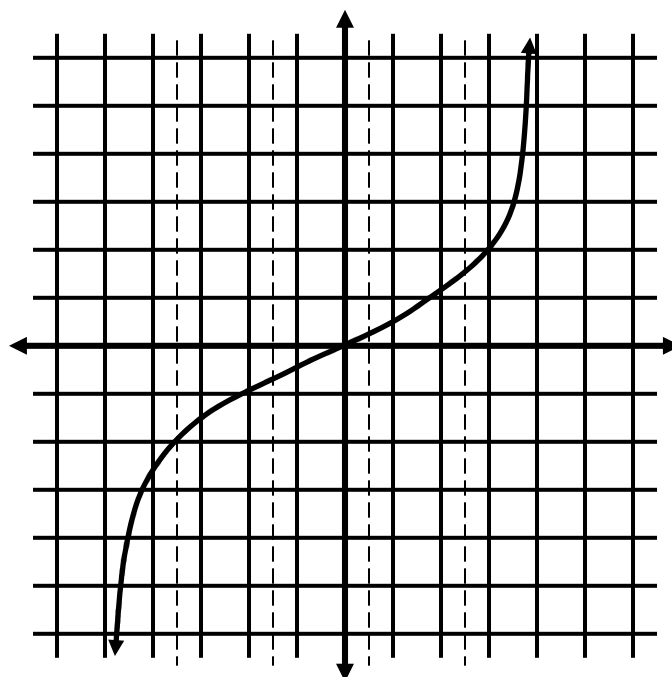
## Functions

I. **A. Definition:** A function is a relationship between 2 variables such that every element in the independent variable(x) has one and only one value in the dependent(y) variable.

1. An easy way to figure out which is dependent and independent is to look at the equation. Typically, we see an equation of y equals in terms of x:

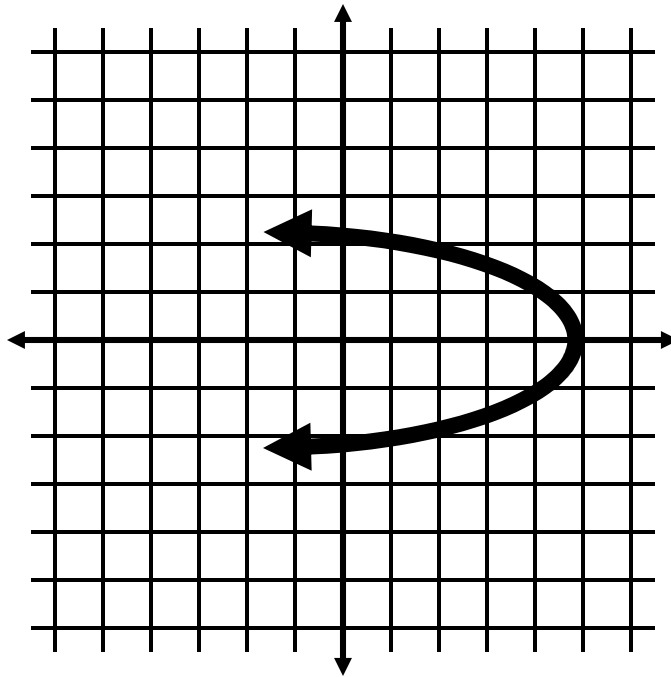
$y = x - 2$ ; Can you see that the outcome of y depends on what x is; therefore, y is the dependent variable and x is independent.

2. a) If given a graph, to determine whether it's a function, use the vertical line test: Take an imaginary vertical line and sweep across your function, if the vertical line touches the function more than once, then it's not a function.



$$y = x^3$$

Imaginary line touches the graph only once at all values.



b) If given solution sets, make sure that the independent variable (typically the first number) doesn't repeat. If it does, then that means that 1 x will have 2 y's failing the vertical line test...

$\{(2,3), (3,4), (5,6), (6,7)\}$  This relation is a function.

$\{(2,3), \underline{(3,4)}, (5,6), \underline{(3,6)}, (6,7)\}$  This relation is not a function because 3 has two dependent values, therefore it is not a function.

## **B. Operations with functions:**

Given that  $F(x) = -2x + 3$  and  $G(x) = x^2 - 2x$

1)  $(F + G)(x) =$  This just means to add the two equations, so just add the like terms:

$$-2x + 3 + x^2 - 2x \Rightarrow x^2 - 4x + 3$$

2)  $(F - G)(x) =$  Be careful on this one because you must subtract the entire second equation from the first. A common mistake is to change the sign of only the first term of the second equation:

$$(-2x + 3) - (x^2 - 2x) \text{ then distribute the negative}$$

$$-2x + 3 - x^2 + 2x \text{ then add or sub like terms}$$

$$-x^2 + 3.$$

3)  $(FG)(x) =$  Typically no sign indicates multiplication. So multiply every term in the first with every term in the second and then combine your like terms:

$$(-2x + 3)(x^2 - 2x) \text{ Multiply to get,}$$

$$-2x^3 + 4x^2 - 3x^2 - 6x \text{ Combine like terms to get,}$$

$$-2x^3 + x^2 - 6x.$$

4)  $(F/G)(x)$  no trick to this one, just make sure you can't simplify in the end:

$$\frac{-2x + 3}{x^2 - 2x}$$