FUNCTIONS

An equation is a function if for any *x* in the domain of the equation, the domain being all the *x*'s that can be plugged into the equation, the equation will yield exactly one value of *y*. A function is typically written in the form:

$$f(x) = y$$

Function Notation:

$f(x)$ is nothing more than an elaborate way of writing the *y* in a function and allows one to identify unique notation for each individual function. Using function notation allows us to represent the value of the function at a given x within a domain in a clean compact way, and in many ways, including, but not limited to:

$f(x)$
$g(x)$
$h(x)$

It is important to recall that this is not some letter times *x*, this is just a elaborate way of writing *y*.

Evaluating a Function:

Evaluating a function is simply done by substituting everywhere you see an *x* on the right side with the value that is within the parenthesis on the left side.

Finding the Roots of a Function:

A root is simply a number for which the function results in zero. In other words where:

$$f(x) = 0$$

One of the more important concepts of a function is that of the domain and range. The domain of a function is the set of all values that can be plugged into a function and have the function exist and have a real number for a value. So, for the domain we need to avoid division by zero, square roots of negative numbers, logarithms of zero, negative numbers, etc.

The range of a function is simply the set of all possible values that a function can take.

Function Composition:

The composition of *f(x)* and *g(x)* is written as:

$$(f \circ g) = f(g(x))$$

Compositions are evaluated by plugging the second function listed into the first function listed. The order in which the functions are listed is important. Interchanging the order will usually result in a different answer.

Concept Example:

The following problem introduces the concept reviewed within this module. Use this content as a primer for the subsequent material.

Given the function $f(x) = 9x^2$ and $g(x) = 4x^3 + 2$ write the composition of f(x) and g(x):

Solution:

Recall that the composition of *f(x)* and *g(x)* is written as:

$$(f \circ g) = f(g(x))$$

Therefore, given $f(x)=9x^2$ and $g(x)=4x^3+2$, plug g(x) in to the function f(x) such that:

$$f(4x^3+2)=9(4x^3+2)^2$$

$$9\left[(4x^3+2)(4x^3+2)\right]=9\left[16x^6+16x^3+4\right]$$

$$144x^6+144x^3+36$$

Therefore:

$$(f\circ g)=4x^6+4x^3+1$$