**Domain and Range**

Some students have been asking for help on **Domain** and **Range**. I decided to send this extra help to all of you, in case you find it useful:

**Domain is the set of all possible values of the input (the x-values).**

Some examples:

(1) If we have a function like y = 2 **/**(x - 40), then x cannot equal 40, because it would yield a zero on the denominator, and we know we cannot divide by zero (it would be undefined). The domain in this case is all real numbers except 40, or in interval notation: (-infinity, 40) U (40, infinity).

(2) Let's say we have y = 13 / (5x + 35).  We ask ourselves...what value of "x" would give me a 0 on the denominator, so that we can discard that value?

We set the denominator 5x + 35 = 0 and solve for x; we get x = -7. This means that we must exclude -7 from the domain.

 So, the domain is (-infinity, -7) U (-7, infinity).

(3) If we have y = square root of (x - 3), then x would need to be greater than or equal to 3. Why?

For square roots (or other even roots, like 4th root, 6th root, etc.) the radicand (*quantity inside the radical*) cannot be negative; recall from your previous algebra courses that if it were negative, we would not obtain a real number.

Since we can only have a radicand that is positive or zero, then the radicand  "x - 3" has to be greater than or equal to 0, thus the x-values must be greater than or equal to 3. Notice that if we replace x with any number less than 3, it would yield a negative radicand  :-( (Therefore, the domain for this example is [3, infinity).

(4) Another example: y = x²  Since we can square any x-value, whether positive, negative, or zero, then we do not have any restrictions on these values; therefore, we say that the domain includes all the real numbers, that is, (-infinity, infinity).

So, to find the domain of any given function, always look for any restrictions, that is, any value(s) of x that would make the expression undefined.

**Range is the set of all possible values of the output (the y-values).**In other words, what do we get when we input x-values from the domain and simplify?

For our previous examples:

(1): Dividing the numerator “2” by a positive or a negative quantity (we know the denominator will not be zero), will yield only positive or negative outcomes, respectively. So, the range would be (-infinity, 0) U (0, infinity).  We use the same reasoning for example (2).

For example (3): We already know that we can only have a radicand that is positive or zero. The sqrt of zero is 0, and the sqrt of a positive number is positive. So, the range is either 0 or positive. In interval notation,  [0, infinity

For example (4), y = x²: When we square zero, we get 0, when we square a positive quantity, we get a positive outcome, and when we square a negative quantity, we also get a positive outcome. So, we get either zero or a positive outcome. The range is the set of y-values greater than or equal to 0, or in interval notation, [0, infinity).

***Hint:* You can always graph the given function to verify your answers.**

Domain: From where to where do the x-values go? Are there any restrictions? That is, is there any value for x we cannot use?

Range: From where to where do the y-values go?

Hope this has helped, :)

Paul

**PS: Check the power point from 1.3 for additional help (in Blackboard).**