**Domain**

When we are asked to find the domain of a function, we are being asked which values of our input variable are allowable. Useful questions to ask yourself when finding domain are "what are my possible values of x?" or alternatively, "what values of x are not possible for this function?"

When finding domain for a given equation, there are really only two cases that we need to worry about when trying to determine our possible x values. If these two cases do not apply to the function given, then your domain will simply be all real numbers because there are no x values that are troublesome. The two special cases are listed below:

1. **You must make sure to EXCLUDE from your domain any x value that will give you zero in the denominator of a fraction, because a function is undefined when we have a value of zero in the denominator of a fraction.**

Example: Find the domain of: \( f(x) = \frac{x - 3}{x + 2} - 5x^2 + 2x - 3 \)

In this example, the only thing we are concerned about is what value(s) of x will give us zero in the denominator of a fraction. Thus, all we care about is to make sure to exclude from our domain the value of x that will make \( x + 2 = 0 \). If we solve for x in this equation we get \( x = -2 \). Therefore, our domain will be all real numbers EXCEPT \( x = -2 \), and in interval notation:

   Domain: \(( -\infty, -2 ) \cup (-2, \infty)\)

2. **You must make sure that you never get a negative value inside an even radical. To ensure that this never happens, you must take the entire expression under the radical sign (the radicand) and set it greater than or equal to zero. When you solve this inequality you will have the allowable values of x for your function, which is your domain.**

Example: Find the domain of \( f(x) = 4x - 2x^3 + \sqrt{3x + 2} \)

In this example, the only thing we are concerned about is that the radicand never be negative. Thus we take the expression under the radical (just the inside!) and set it greater than or equal to zero and solve. This gives us the allowable x values for our function, or domain of our function.

Now, we have found the x values that are allowable, and this is our domain. If we wanted to write the domain in interval notation we would write: Domain: \((-2/3, \infty)\)