<u>The Rational Zero Test</u>

The ultimate objective for this section of the workbook is to graph polynomial functions of degree greater than 2. The first step in accomplishing this will be to find all real zeros of the function. As previously stated, the zeros of a function are the x intercepts of the graph of that function. Also, the zeros of a function are the roots of the equation that makes up that function. You should remember, the only difference between an polynomial equation and a polynomial function is that one of them has $f_{(x)}$***.***

You will be given a polynomial equation such as $2x^4+7x^3-4x^2-27x-18=0$***, and be asked to find all roots of the equation.***

The Rational Zero Test states that all possible rational zeros are given by the factors of the constant over the factors of the leading coefficient.

$$\frac{factors\ \ of\ \ the\ \ constant}{factors\ \ of\ \ the\ \ leading\ \ coefficient}=all\ \ possible\ \ rational\ \ zeros$$

Let's find all possible rational zeros of the equation $2x^4+7x^3-4x^2-27x-18=0$***.***

We begin with the equation $2x^4+7x^3-4x^2-27x-18=0$***.***

The constant of this equation is 18, while the leading coefficient is 2. We do not care about the (-) sign in front of the 18.

Writing out all factors of the constant over the factors of the leading coefficient gives the following.

$$\frac{\pm1,\ \ \pm2,\ \ \pm3,\ \ \pm6,\ \ \pm9,\ \ \pm18}{\pm1,\ \ \pm2}$$

These are not all possible rational zeros. To actually find them, take each number on top, and write it over each number in the bottom. If one such number occurs more than once, there is no need to write them both.

$$\pm1,\ \ \pm2,\ \ \pm3,\ \ \pm6,\ \ \pm9,\ \ \pm18,\ \ \pm\frac{1}{2},\ \ \pm\frac{3}{2},\ \ \pm\frac{9}{2}$$

These are all possible rational zeros for this particular equation.

The order in which you write this list of numbers is not important. The rational zero test is meant to assist in the overall objective of finding all zeros to the polynomial equation $2x^4+7x^3-4x^2-27x-18=0$***. Each of these numbers is a potential root of the equation. Therefore, each will eventually be tested.***