**What happens when we can't solve a polynomial by factoring or the quadratic formula?**

We use the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to determine the list of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rational, real roots (solutions/zeros).

The ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*** says we can determine all

of the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** roots using where \_\_ is all of

the factors of the **\_\_\_\_\_\_\_\_\_\_\_\_\_** term and \_\_ is all of the factors of the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

**Example: List all of the possible rational real roots for the polynomial function.**

**1.) Identify p & list all possible factors.**

**2.) Identify q & list all possible factors.**

**3.) Simplify each factor of p with each factor of q. Add a ± in front of each answer. You do \_\_\_\_\_\_\_\_\_ have to write \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!**

**Using the RATIONAL ROOT THEOREM to find real zeros:**

**1.) List all of the possible roots.**

**2.) Test the possible roots.**

*\*To test, use synthetic division. You know you have reached a root when your remainder is zero.*

*\*ALWAYS start by testing 1, then - 1, then your next lowest positive #, followed by your next lowest negative # and so on.*

*\*Don't forget to write this value down in your answer box!*

**3.) Keep testing possible roots until you reach a polynomial that YOU can factor or use the quadratic formula on. Write the polynomial in standard form and solve.**

*\*Every time you perform synthetic division and find a zero that works, the degree decreases by 1.*

**4.) Write the remaining roots in your answer box.**

*\*Your DEGREE will match the number of roots you will get!*

***Example: Determine all of the real roots of the polynomial equation.***

|  |  |
| --- | --- |
| **1.)** List the possible rational real roots: | **2.) \***Test the roots: |
| **3.)** Solve the polynomial: | **4.)** Zeros: |

**\*If the first or second or third root you test DOESN’T work, go back to the last polynomial (in standard form) that you got a root to work on.**

When a root occurs more than once (\_\_\_\_\_ times), we say that root has ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*** of \_\_\_\_\_\_.

***Example: State the multiplicity for the previous example.***

***Example: State the zeros and multiplicity for the polynomial function.***