Math 3 **4.4 Fundamental Theorem of Algebra** Unit 4

*SWBAT solve for the total possible real roots using the Rational Root Theorem.*

**Rational Root Theorem:**

This theorem states all the *possible* rational roots of a polynomial.

It is helpful for finding roots when you do not have a calculator!

$$\frac{Factor of the constant term}{Factor of the leading coefficient}$$

**Example 1:** What are the rational roots of 

Leading Coefficient: Constant Term:

Leading Co-Factors: Constant Factors:

Rational Roots:

**You Try!** What are the rational roots of 

Leading Coefficient: Constant Term:

Leading Co-Factors: Constant Factors:

Rational Roots:

**Descartes’ Rule of Signs**

Let P(x) be a polynomial with real coefficients written in standard form.

* The number of **positive real roots** of P(x) = 0 is either equal to the number of sign changes between consecutive coefficients of P(x) or is less than that by an even number.
* The number of **negative real roots** of P(x) = 0 is either equal to the number of sign changes between consecutive coefficients of P(-x) or is less than that by an even number.

**Example 2:** What does Descartes’ Rule of Signs tell you about the real roots of 

**You Try!** What does Descartes’ Rule of Signs tell you about the real roots of 

Polynomial Practice

**Write each polynomial function in standard form. Then classify it by degree and by number of terms.**

**1.** f(*n)* = 4*m*2 − *m* + 7*m*4 **2.** *f*(*t*) = 4*t* + 3*t*3 + 2*t* − 7 **3.** *f*(*r*) = 5*r* + 7 + 2*r*2

**Divide using long division: Divide using synthetic division:**

**4.** (*x*3 + 3*x*2 − *x* − 3) ÷ (*x* − 1) **5.** (2*x*3 − 3*x*2 − 18*x* − 8) ÷ (*x* − 4)

**Find all solutions of each equation.**

**6.** *x*3 − 16*x* = 0 7**.** 6*x*3 − 2*x*2 + 4*x* = 0

**8.** What is *P*(−4) given that *P*(*x*) = 2*x*4 − 3*x*3 + 5*x*2 − 1?

**9.** Use the Rational Root Theorem to list all the possible rational roots for the equation 3x4 + 2x2 – 12 = 0

**10.** What does Descartes’ Rule of Signs tell you about the real roots of the polynomial -5x3 – 2x2 + 9x + 30 = 0?

**11.** For the polynomial function , your friend says the end behavior of the graph is down and up. What mistake did your friend make?