Welcome to Class

-All cell phone in the holder

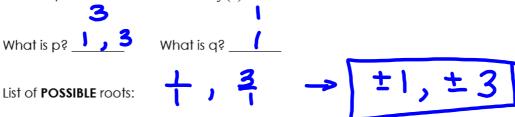
Warm-up

- 1. Is (x + 1) a factor of $5x^3 + x^2 5x 1$?
- 2. If x = -1 is a solution factor the polynomial $5x^3 + 9x^2 + 3x 1$.

The Rational Zero Theorem:

WHY IT IS IMPORTANT: <u>Narrows the search for rational zeros to a finite list.</u>
-It gives a place to start to find the answer.

- If $P(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0$ has integer coefficients $(a_n \neq 0)$ and $\frac{p}{q}$ is a rational zero (in lowest terms) of p, then p is the factors of the constant term a_0 and q is the factors of the leading coefficient a_n .
- **EX 1:** Find the possible rational roots of $f(x) = x^3 + 6x^2 + 10x + 3$.



EX 2: Find the possible rational roots of $f(x) = 3x^3 + 5x^2 + 7x + 2$.

What is p?
$$1, 2$$
 What is q? $1, 3$

List of POSSIBLE roots: $\frac{1}{1}, \frac{2}{7}, \frac{1}{3}, \frac{2}{3} \rightarrow \frac{\pm 1}{3}, \pm 2$

EX 3: Find the possible rational roots of $2x^3 + 5x^2 - 6x - 8 = 0$.

Steps for Finding the Zeros of a Polynomial Function:

- 1) Gather General Information.
 - Determine the **degree** *n* of the polynomial function.
 - The **number of zeros** of the polynomial function is **at MOST** *n* (the degree).
- 2) Check rational zeros.
 - Apply the **Rational Zero Theorem** to list rational numbers that are **POSSIBLE zeros**.
 - Use **synthetic division** to test the numbers in the list.
 - The number is a solution if the remainder is **ZERO**.
- 3) Work with the reduced/depressed polynomial.
 - Each time a zero is found, obtain the reduced/depressed polynomial.
 - Work to get a reduced polynomial of degree 2.
 - Then, find its zeros by **factoring** or by applying the **quadratic formula**.

EX 4: Find the zeros of
$$f(x) = x^3 - 7x^2 + 16x - 12$$
.

At most _____ zeros.

Rational Root Theorem – Possible rational zeros:

Find the roots:

$$X^2-5x+6=0$$

 $X^2-5x+6=0$
 $X^2-5x+6=0$

EX 5: Find the zeros of $g(x) = 3x^4 + 23x^3 + 56x^2 + 52x + 16$

When a root occurs more than once, we say that root has **MULTIPLICITY**

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

$$f(x) = (x+2)(x+2)(x+2)$$

$$X+2=0 \quad x+2=0 \quad x+2=0$$

$$X=-2 \quad x=-2 \quad x=-2$$

$$X=-2 \quad mult. of 1$$

$$X=3 \quad mult. of 4$$

$$X=0 \quad x=0 \quad x+2=0$$

$$X=3 \quad mult. of 4$$

$$X=0 \quad x=0 \quad x-3=0 \quad x+2=0$$

$$X=0 \quad x=0 \quad x=3=0 \quad x+2=0$$

$$X=0 \quad x=0 \quad x=3=0 \quad x+2=0$$

$$X=0 \quad x=0 \quad x=3=0 \quad x+2=0$$

Around the room Practice

- -Yes, you will turn in.
- -Yes, you need to show work
- -No, your order will not be the same as others. $\frac{1}{4} = \frac{1}{\sqrt{2}} = \frac{1}{4}$

Quick Check Tomorrow!