Name: _____ Date: _____ **Unit 6 Class Work**

Root Theorems Class Work

Objective: *You will be able to identify roots of polynomial expressions, and write polynomial expressions provided with their roots.*

Quick Review:

~ What is a root of a polynomial?

~ How can you determine if a factor is a root, using polynomial division?

Rational Root Theorem:

The possible real rational roots of any polynomial are the ratios of the factors of the constant term and factors of the leading coefficient!

Guided Example A: Determine all roots of the function $3x^3 + x^2 - 4x + 12 = 0$.

Guided Example B: Determine all roots of the function $2x^4 - 9x^3 + 22x^2 - 81x + 36 = 0$.

*If you are unsure which root to use, you may use your graphing calculator as a guide! ☺

Why can we not use the graphing calculator to determine ALL roots??

✎ **Practice:** Determine all roots of each function, as well as their multiplicities.

1. $3x^4 + 7x^3 - 73x^2 - 175x - 50 = 0$

2. $4x^3 - 14x^2 + 13x - 21 = 0$

3. $2x^3 - x^2 + 8x - 4 = 0$

4. $x^3 - x^2 - 108x - 288 = 0$

5. $2x^4 + 3x^3 - 32x^2 - 57x + 36 = 0$

***Assume one of your classmates was absent today. What advice, hints, tips, reminders, explanations, etc. would you provide them to help them understand what they missed regarding the rational root theorem?**

Quick Review:

~ If one root of a polynomial is x = 3, how could you write the factor that corresponds?

~ If one root of a polynomial is x = 2 - i, how could you write the factor that corresponds?

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~ How can you determine if a factor is a root, using polynomial division?

★ **Irrational Root Theorem:**	★ **Imaginary Root Theorem:**
Example: Write a polynomial function that has roots at $x = 4, 3 + \sqrt{7}$.	**Example:** Write a polynomial function that has roots at $x = -3, 2 - 3i$.

✎ **Practice:** Write a polynomial in standard form having the given roots.

1. $x = 5, 3 + \sqrt{3}$

2. $x = 1 - 5i, 1 - \sqrt{8}$

3. $x = -9, 4 - i\sqrt{2}$

4. $x = -2, 3 - i\sqrt{5}$

5. $x = 1 + \sqrt{2}, 1 - 3i$

6. $x = 3i, -i\sqrt{3}$

***<u>Reflect</u>:**

How has your knowledge of polynomial functions and their roots improved since the beginning of the year?

Is there anything you are still unsure about when it comes to polynomials and their roots? If so, please explain and show me!

Did you face any challenges when working with polynomials and their roots, and if so how did/will you overcome them?