Dream Book Work
Please get your "Dream Book" from the front table and a gold NeSA reference sheet.
Please work pages 20 - 23

Bell Work
Write a polynomial function in standard form given the following zeros.
\[ x = 4, 5, 6 \]
\[ (x-4)(x-5)(x-6) \]
\[ x^2 - 5x + 20 \]
\[ (x^2 - 9)(x + 20) \]
\[ x^3 - 6x^2 - 9x^2 + 54x + 20x - 120 \]
\[ x^3 - 15x + 74x - 120 \]

Quiz Review
Solve the polynomial function.
\[ x^4 - 13x^2 + 36 = 0 \]
\[ (x^2 - 9)(x^2 - 4) \]
\[ (x - 3)(x + 3)(x - 2) \]
\[ x^2 - 9 = 0 \quad x^2 - 4 = 0 \]
\[ x = \pm 3 \quad x = \pm 2 \]

Find the zeros
Find the y-intercept
State the end behavior
Pick points between the zeros and find two or three more coordinates.
Graph the function.

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5.5 Theorems about Roots of Polynomial Equations
Factoring Polynomials can be challenging, especially if the first and last terms have many factors.
You can use guess and check to factor, but this is inefficient unless there is a way to minimize the number of guesses.
The Rational Root Theorem minimizes the number of guesses.
Given a polynomial $P(x)$ with integer coefficients, there are a limited number of possible roots of $P(x) = 0$.

1) Integer roots - factors of the last term, $a_0$.

2) Rational roots - have the form of $p/q$, $p$ is an integer factor of $a_0$ (last term) $q$ is an integer factor of $a_1$ (first term).

Factoring $21x^2 + 29x + 10 = 0$ gives $p = 21$, $q = 10$.

Factors of $±1, ±2, ±5, ±10$.

One possible factor is $5/3$.

What are some other possible factors of the polynomial?

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**Conjugate Root Theorem**

Irrational roots $(a + \sqrt{b})$ come in pairs if $a + \sqrt{b}$ is a root of the polynomial, then so is $a - \sqrt{b}$.

If $6 + \sqrt{5}$ is a root, then so is $6 - \sqrt{5}$.

Complex roots $(a + bi)$ come in pairs if $a + bi$ is a root of the polynomial, then so is $a - bi$.

If $9 + 2i$ is a root, then so is $9 - 2i$.

If $-8i$ is a root, then so is $8i$.

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**What are the rational roots of:**

The only possible rational roots have the form:

$q_0$ (factor of constant term) $q_1$ (factor of leading coefficient term)

Factors of the constant term: $±1, ±2, ±3, ±6$

Factors of the leading coefficient term: $±1$

The only possible rational roots are $±1, ±2, ±3, ±6$.

Check the values of $P(x)$ for possible roots:

$x^3 + 4x^2 + 4x + 16$

$x^3 - 5x^2 - 2x + 10 = 0$

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**Irrational roots (a + √b) come in pairs**

If $a + \sqrt{b}$ is a root, then so is $a - \sqrt{b}$.

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