## Section 5-6 The Fundamental Theorem of Algebra

Students will be able to use the Fundamental Theorem of Algebra to solve polynomial equations with complex solutions.

You can factor any polynomial of degree n into n linear factors, but sometimes the factors will involve imaginary numbers.

-The degree of the polynomial tells you how many roots and equation has.

 $y = x^2$  has how many roots?

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Find the roots of the following:

$$0 = 1/x^{2} - 9$$

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$$0 = x^{2} - 2x + 1$$

$$0 = (x - 1)(x - 1)$$

$$0 = x^{2} + 3x + 1$$

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German mathematician Carl Friedrich Gauss is credited with proving the Fundamental Theorem of Algebra:

If P(x) is a polynomial of degree  $n \ge 1$ , then P(x) = 0 has exactly n roots, including multiply and imaginary roots.

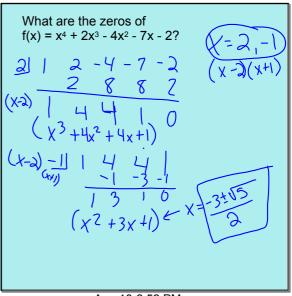
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What are all of the roots of  $x^4 + 2x^3 = 13x^2 - 10x$ 

$$0 = x^{4} + 2x^{3} - 13x^{2} + 10x$$

$$x = -5, 0, 1, 2$$

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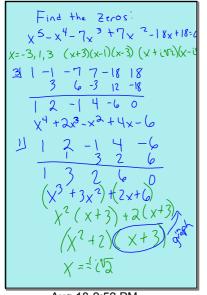
## Concept Summary:

Equivalent ways to state the Fundamental Theorem of Algebra.

- 1. Every polynomial of degree  $n \ge 1$  has exactly n roots, including multiple and imaginary roots
- 2. Every polynomial of degree  $n \ge 1$  has n linear factors.
- 3. Every polynomial function of degree  $n \ge 1$  has at least one complex zero.

Hwk: pg. 322-323 #10 - 38 (4th)

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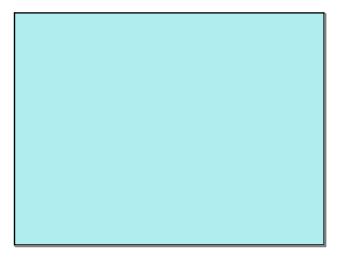


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