Linear Factors and Zeros of Polynomial Functions

- *Students will be able to solve polynomials by factoring, and write a polynomial function given zeros*

DATE

Algebra 3-4

What are the "zeros" of a polynomial function?

The Fundamental Theorem of Algebra:

"If P(x) is a polynomial of degree n ≥ 1, then P(x) = 0 has exactly n roots, including multiple and complex roots"

What this means is: "Every Polynomial function has exactly as many roots/zeros/solutions as the highest exponent (or the degree of the polynomial)"

Example 1: List the zeros of $f(x) = (x - 3)(x + 1)(x - 1)$.

(How many are there?)

Example 2: List the zeros of $f(x) = 2x(x + 8)(x - 2)(3x - 4)$.

(How many are there?)

Example 3:

Factor the Polynomial and find all the real solutions:

a. $x^3 - 2x^2 - 15x = 0$ ***(How many are there?)***

b. $-3x^4 + 6x^3 = -45x^2$ ***(How many are there?)***

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What is multiplicity?

The multiplicity of the zero of a function describes how many times the solution appears (solutions can appear more than once . . .)

The multiplicity of a zero can be determined by looking at the completely factored form of a polynomial

Example 4: List the zeros for the polynomial function $f(x) = x(x - 2)^2(x + 4)$. State the multiplicity of each zero.

Example 5: Factor the polynomial $f(x) = x^4 - 2x^3 - 8x^2$ to find its zeros. State the multiplicity of each zero.

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Can a polynomial be written if we know the zeros?

Example 6: **Write a polynomial function in Standard Form that has the following zeros:**

a. 2, 5, -1

b. -1, 4, 2, 0