Friday 12/6/19

1. Grab Notes/Calc.
2. Take out HW/Calendar
3. Turn in "Law of Life" Essay in tray.
4. Complete Warm-up/HW Check
5. Roots to Factors Notes

Topic: Roots/Zeros of Polynomials to Factors **Name**: _____

What am I learning today?

Warm-Up

Solve the following polynomials by factoring:

1. $f(x) = 3x^2 - 10x + 8$

$-6, -4$ $\quad -24 = 10$

$(3x^2 - 6x) + (-4x + 8)$

$3x(x-2) - 4(x-2)$

$(3x-4)(x-2) = 0$

$3x - 4 = 0 \quad x - 2 = 0$

$x = \frac{4}{3} \quad x = 2$

2. $f(x) = 3x^2 + 12x$

$3x(x+4) = 0$

$3x = 0 \quad x + 4 = 0$

$x = 0 \quad x = -4$

3. $f(x) = 2x^2 - 98$

$2(x^2 - 49)$

$2(x+7)(x-7)$

$x + 7 = 0 \quad x - 7 = 0$

$x = -7, 7$

Vocabulary

Roots/Zeros

Roots & _zeros_ are solutions to a function. When a root/zero is plugged into a variable, it makes the function equal to _0_.

To find the roots/zeros of a function, _FACTOR_ the polynomial COMPLETELY, then set each factor equal to zero and solve (like in the warm-up).

However, if you're given the roots/zeros and are asked to create the polynomial, then you have to work backwards. Follow these steps:

1. Write down the _zeros_.
2. Write the corresponding factors by getting each equal to zero.
3. Multiply out the factors (_BOX METHOD_ or _DISTRIBUTING_)
4. Use "$f(x)$" notation when writing your final polynomial.

$x = 1$

$x - 1 = 0$

Example:

Given the following roots/zeros, write the corresponding polynomial in factored & polynomial form:

a. **x = 2 and x = -1/3**

$3x = -\frac{1}{3} \cdot 3$

$3x = -1$

$3x + 1 = 0$

$x - 2 = 0$

FACTORED FORM:

$f(x) = (x-2)(3x+1)$

POLYNOMIAL FORM:

$f(x) = (x-2)(3x+1)$

$= 3x^2 + 1x - 6x - 2$

$f(x) = 3x^2 - 5x - 2$

b. **x = 3 and x = -3**

FACTORED FORM:

$f(x) = (x-3)(x+3)$

POLYNOMIAL FORM:

$f(x) = (x-3)(x+3)$

$= x^2 + 3x - 3x - 9$

$f(x) = x^2 - 9$

Topic: Roots/Zeros of Polynomials to Factors **Date:** _____

You Try

Given the following roots/zeros, write the corresponding polynomial in **factored** & **polynomial** form

1. x = -2/3 and x = 1

$f(x) = (3x+2)(x-1)$

$= 3x^2 - 3x + 2x - 2$

$f(x) = 3x^2 - x - 2$

2. x = 0 and x = 5

$f(x) = x(x-5)$

$f(x) = x^2 - 5x$

3. x = 4, x = -1 and x = 1/2

$f(x) = (x-4)(x+1)(2x-1)$

$= (x^2 - 3x - 4)(2x-1)$

$f(x) = 2x^3 - x^2 - 6x^2 + 3x - 8x + 4$

$f(x) = 2x^3 - 7x^2 - 5x + 4$

Vocabulary

Complex Roots/Zeros

Complex Conjugates

Solutions are not always real numbers. Sometimes we get solutions that are imaginary numbers (or complex numbers). Remember, these are solutions that include the letter "i".

$i^2 = -1$

****IMPORTANT****

If a complex number is a root/zero, then so is it's conjugate

(Remember, the complex conjugate of $a + bi$ is $a - bi$)

For example: if $x = 4i$ is a root/zero, then so is it's conjugate, $x = -4i$

$x = 4 - i$, $x = 4 + i$

Examples

Example: Given the following roots/zeros, write the corresponding polynomial in factored & polynomial form.

a. $x = 3i$, $x = -3i$

$f(x) = (x - 3i)(x + 3i)$

$= x^2 - 9i^2$ $(i^2 = -1)$

$f(x) = x^2 + 9$

b. $x = 2$, $x = 5i$, $x = -5i$

$f(x) = (x-2)(x-5i)(x+5i)$

$= (x-2)(x^2 - 25i^2)$

$= (x-2)(x^2 + 25)$

$f(x) = x^3 + 25x - 2x^2 - 50$

$f(x) = x^3 - 2x^2 + 25x - 50$

You Try

Given the following roots/zeros, write the corresponding polynomial in factored & polynomial form.

a. $x = -2i$, $x = 2i$

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

$= x^2 - 2ix + 2ix - 4i^2$

$f(x) = x^2 + 4$

b. $x = 0$, $x = -i$, $x = i$

$f(x) = x(x + i)(x - i)$

$= x(x^2 - ix + ix - i^2)$

$= x(x^2 + 1)$

$f(x) = x^3 + x$

Summary

Summarize the lesson in your own words