Day 07 Writing Equations of Polynomial Functions

Learning Target 4: I can write the equation of a polynomial function given its zeros/roots or graph.

INTRO: Write the standard form of the given quadratic function.

$y = a(x+2)(x-5)$

$-3 = a(-1+2)(-1-5)$

$-3 = a(1)(-6)$

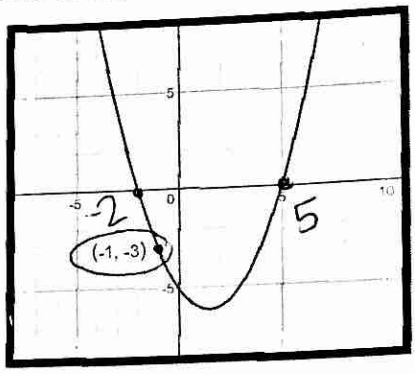
$-3 = -6a$

$\frac{-3}{-6} = a$

$y = \frac{1}{2}(x+2)(x-5)$

$= \frac{1}{2}(x^2-3x-10)$

$y = \frac{1}{2}x^2 - \frac{3}{2}x - 5$



What are the proper steps to write an equation when given the roots?

1. Write the equation in intercept form w/ a as a variable.
2. Plug in a point to find a.
3. Replace a with its value.
4. Simplify the equation

1-4: Write the standard form of the polynomial function with the given roots. Assume that a = 1.

1. $x = \{-4, 0, 4, 2\}$

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

$x(x^2-16)(x-2)$

$(x^3-16x)(x-2)$

$f(x) = x^4 - 2x^3 - 16x^2 + 32x$

2. $x = \{3i, -\frac{3}{2}\}$

$f(x) = (x^2+9)(2x+3)$

$f(x) = 2x^3 + 3x^2 + 18x + 27$

3. $x = \{8, i, -i\}$

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

$= x^3 + x - 8x^2 - 8$

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

4. $x = \{3, 2, 1+i\}$

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

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

$= (x^2-5x+6)(x^2-2x+2)$

$= x^4 - 2x^3 + 2x^2$

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

$+6x^2 - 12x + 12$

$f(x) = x^4 - 7x^3 + 18x^2 - 22x + 12$

$x = 1 \pm i$

$x - 1 = \pm i$

$(x-1)^2 = (\sqrt{-1})^2$

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

$(x-1)^2 + 1$

$x^2 - 2x + 1 + 1$

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

5-7: Write the factored form of the polynomial function described. You must find a!

5. The functiion that contains the point (-1, 160) and has roots $1, -\frac{2}{3}, 2i$, and a double root at -3.

$f(x) = a(x-1)(3x+2)(x^2+4)(x+3)^2$

$160 = a(-1-1)(-3+2)(1+4)(-1+3)^2$

$160 = a(-2)(-1)(5)(4)$

$160 = 40a$

$4 = a$

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

6. The function has roots 4, i, and $\frac{5}{2}$, and also has a y-intercept of -60.

$f(x) = a(x-4)(x^2+1)(2x-5)$

$-60 = a(-4)(1)(-5)$

$-60 = 20a$

$-3 = a$

$f(x) = -3(x-4)(x^2+1)(2x-5)$

7. The function has a tangent at 5, roots at $\pm 3i$, and contains the point (4, -50).

$f(x) = a(x-5)^2(x^2+9)$

$-50 = a(4-5)^2(16+9)$

$-50 = a(-1)^2(25)$

$-50 = 25a$

$-2 = a$

$f(x) = -2(x-5)^2(x^2+9)$

8-9: REVIEW: Find all of the zeros of each function.

8. $f(x) = x^4 - 3x^3 + 5x^2 - 27x - 36$ $-1, 4$

-1	1	-3	5	-27	-36
		-1	4	-9	36
	1	-4	9	-36	0
4		4	0	36	
	1	0	9	0	

$(x+1)(x^3-4x^2+9x-36)$

$(x+1)(x-4)(x^2+9) = 0$

$(x+1)(x-4)(x^2+9) = 0$

$x^2 = -9$

$x = \sqrt{-9}$

$-1, 4, \pm 3i$

9. $g(x) = x^3 - 11x^2 + 46x - 80$ 5

5	1	-11	46	-80
		5	-30	80
	1	-6	16	0

$(x-5)(x^2-6x+16)$

$x^2 - 6x + 9 = -16 + 9$

$(x-3)^2 = -7$

$x - 3 = \pm i\sqrt{7}$

$x = 3 \pm i\sqrt{7}$

$5, 3 \pm i\sqrt{7}$