Lesson 5.3 Warm Up

1. What is the end behavior of $y = -2x^3 - 5x + 2$?

2. Name the polynomial: $3x^3$

3. What are the zeros of $x(x - 2)(x + 8)$?

4. Factor: $x^3 + x^2 - 12x$

Lesson 5.3 Solving Polynomial Equations

Essential Understanding: If $(x - a)$ is a factor of a polynomial, then the polynomial has value 0 when $x = a$. If a is a real number, then the graph of the polynomial has (a, 0) as an x-intercept.

To solve a polynomial equation by factoring:

1. Write the equation in form $P(x) = 0$ for some polynomial P.
2. Factor P(x). Use the Zero Product Property to find the roots.

Ex. What are the real or imaginary solutions of each polynomial equation?

a. $2x^3 - 5x^2 = 3x$

b. $3x^4 + 12x^2 = 6x^3$

Ex. Solve $(x^2 - 1)(x^2 + 4) = 0$

1 Solve (separate answers with a comma):

$$x^5 + 4x^3 = 5x^4 - 2x^3$$

Concept Summary Polynomial Factoring Techniques

Techniques	Examples
Factoring out the GCF Factor out the greatest common factor of all the terms.	$15x^4 - 20x^3 + 35x^2 = 5x^2(3x^2 - 4x + 7)$
Quadratic Trinomials For $ax^2 + bx + c$, find factors with product ac and sum b.	$6x^2 + 11x - 10 = (3x - 2)(2x + 5)$
Perfect Square Trinomials $a^2 + 2ab + b^2 = (a + b)^2$ $a^2 - 2ab + b^2 = (a - b)^2$	$x^2 + 10x + 25 = (x + 5)^2$ $x^2 - 10x + 25 = (x - 5)^2$
Difference of Squares $a^2 - b^2 = (a + b)(a - b)$	$4x^2 - 15 = (2x + \sqrt{15})(2x - \sqrt{15})$
Factoring by Grouping $ax + ay + bx + by = a(x + y) + b(x + y) = (a + b)(x + y)$	$x^3 + 2x^2 - 3x - 6 = x^2(x + 2) + (-3)(x + 2) = (x^2 - 3)(x + 2)$
Sum or Difference of Cubes $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$	$8x^3 + 1 = (2x + 1)(4x^2 - 2x + 1)$ $8x^3 - 1 = (2x - 1)(4x^2 + 2x + 1)$

Ex. Factor and solve: $x^3 - 27$

Ex. Factor and solve: $8x^3 + 125$

*Remember that the degree of the polynomial tells you how many solutions there are--imaginary and/or real. The equation below can be solved with roots, but how many solutions will that give you compared to how many there should be? Thus, why you need to get it to set to zero and then factor so you can find the imaginary roots as well.

Ex. Solve $x^3 = 1$

Ex. Find all zeros: $x^4 = 16$

Ex. Solve $x(x^2 + 8) = 8(x + 1)$

Lesson 8.3 Day 2 Warm Up (Clickers)

1. What are the zeros of $f(x) = x(x - 2)(x + 5)(x - 2)$?

2. What is the end behavior of $f(x) = -3x^6 - 4x + 9$?

3. Factor: $x^3 + 64$

Ex. Find all roots: $125x^3 - 27 = 0$

2 Find all roots (separate answers with a comma):

$x^3 - 8 = 0$

3 Find all zeros (separate answers with commas):

$x^4 - 64 = 0$

You can use your graphing calculator to solve equations. The problem with this method is that it only gives you the real roots. It does not give you the imaginary ones.

Solve $x^3 + 5 = 4x^2 + x$

Method 1: Graph y1 = $x^3 + 5$ and y 2 = $4x^2 + x$ Then use the intersect feature in CALC. to find the x-values of the points of intersection.

Method 2: Rewrite the equation so it is equal to 0. Then use the zero feature in CALC.

4 What are the real solutions of (round answers to the nearest hundredth)

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

Ex. Close friends Stacy, Jade, and Amy were all born on July 4. Stacy is one year younger than Jade. Jade is two years younger than Amy. On July 4, 2010, the product of their ages was 2300 more than the sum of their ages. How old was each friend on that day?

What are three consecutive integers whose product is 480 more than their sum?