

Aim: How do we solve polynomial equations? (Chapter 5.3)

Do Now: Use your graphing calculator to find the roots of the equation $2x^3 - 5x^2 = 3x$. In addition, describe what type of roots does it have? What is the y-intercept? Find an alternative method to find the roots of the equation without graphing.

I. Find the real or imaginary solutions of each equation by factoring.

1.

Take note	
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 $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$	$8x^3 + 1 = (2x + 1)(4x^2 - 2x + 1)$ $8x^3 - 1 = (2x - 1)(4x^2 + 2x + 1)$

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

3. $x^4 + 5x^2 = 6$

4. Sum or Difference of Cubes – Why do they work?

II- Exercises

1. $x^3 + 512 = 0$

To start, write $x^3 + 512$ as a sum of cubes and factor.

$$x^3 + 8^3 = 0$$

$$(x + 8)(x^2 - 8x + 64) = 0$$

2. $x^4 + 2x^3 = 10x^2$

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3. $x^3 + 4x^2 - 2x - 8 = 0$

4. $x^4 - 25 = 0$

5. **Writing** Show how you can rewrite $\frac{x^6}{y^9} - \frac{1}{27}$ as a difference of two cubes.

6. The product of three consecutive integers is 720. What are the numbers?

7. The height of a box is 3 cm less than the width. The length is 2 cm less than the width. The volume is 50 cm^3 . What is the width of the box?

8. Your sister is 8 years older than you. Your mother is 25 years older than your sister. The product of all three ages is 18,816. How old is your mother?