

## 5-3 Solving Polynomials Equations

**Objectives:**

- To solve polynomial equations by factoring.
- To solve polynomial equations by graphing.

**Common Core Content Standard:**

**A.REI.11** Explain why the x-coordinates of the points where the graphs of the equations  $y = f(x)$  and  $y = g(x)$  intersect are the solutions of the equations  $f(x) = g(x)$  ...

Also **A.SSE.2**

**Example 1: Solving Polynomial Equations Using Factors**

What are the real or imaginary solutions of  $4x^3 - 6x^2 = 4x$ ?

**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**

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$8x^3 + 1 = (2x + 1)(4x^2 - 2x + 1)$$

$$8x^3 - 1 = (2x - 1)(4x^2 + 2x + 1)$$

**Example 2: Solving Polynomial Equations by Factoring**

What are the real or imaginary solutions of the equation  $2x^3 = -54$ ?

**Example 3: Finding Real Roots by Graphing**

What are the real solutions of the equation  $2x^3 + 5 = 3x^2 - 2x$ ?

**Example 4: Modeling a Problem Situation**

What are three consecutive even integers whose product is 4 times their sum?