February 12, 2020

5.2 - Solving Polynomials with Real/Non-Real Solutions - Day 2 -

Sum and Difference of Cubes

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

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

*When a and b are perfect cubes.

Perfect Cubes:

1^3 --> **1**
2^3 --> **8**
3^3 --> **27**
4^3 --> **64**
5^3 --> **125**
6^3 --> **216**
7^3 --> **343**
8^3 --> **512**
9^3 --> **729**
10^3 --> **1000**
..., ...

Ex.1) **Factor the following.**

$x^3 - 216$

$a = x \quad b = 6$

$(x-6)(x^2+6x+36)$

$8x^3 + 27$

$a = 2x \quad b = 3$

$(2x+3)(4x^2-6x+9)$

Ex.2) **Solve for all zeros.**

$2x^4 = 250x$

$2x^4 - 250x = 0$

$2x(x^3 - 125) = 0$

$2x(x-5)(x^2+5x+25)$

$2x = 0$

$x = 0$ $\quad x = 5$

$x = \dfrac{-5 \pm \sqrt{(5)^2 - 4(1)(25)}}{2(1)}$

$x = \dfrac{-5 \pm \sqrt{-75}}{2}$

simp.

$i\sqrt{75}$
$i\sqrt{25 \cdot 3}$
$5i\sqrt{3}$

$x = \dfrac{-5 \pm 5i\sqrt{3}}{2}$

CheckPoint 1) **Solve for all zeros.**

$$8x^3 + 27 = 0$$

$$(2x+3)(4x^3 - 6x + 9) = 0$$

a b c

$x = -\frac{3}{2}$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(4)(9)}}{2(4)}$$

$$x = \frac{6 \pm \sqrt{-108}}{8}$$

$$x = \frac{6 \pm 6i\sqrt{3}}{8} \quad \div 2$$

$x = -3/2$

$$x = \frac{3 \pm 3i\sqrt{3}}{4}$$

CheckPoint 2 --- CHALLENGE!!!) **Solve for all zeros.**

$$x^7 - 216x^4 + 3456 = 16x^3$$

$$x^7 - 216x^4 - 16x^3 + 3456 = 0$$

$$x^4(x^3 - 216) - 16(x^3 - 216) = 0$$

$$(x^4 - 16)(x^3 - 216) = 0$$

$$(x^2+4)(x^2-4)(x-6)(x^2+6x+36) = 0$$

a b c

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

$x^2 + 4 = 0$

$\sqrt{x^2} = \sqrt{-4}$

$x = \pm 2i$

$x = \pm 2$

$x = 6$

$$x = \frac{-6 \pm \sqrt{6^2 - 4(1)(36)}}{2(1)}$$

$$x = \frac{-6 \pm \sqrt{-108}}{2}$$

$$x = \frac{-6 \pm 6i\sqrt{3}}{2}$$

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