FORMULAS: Sum and difference of perfect cubes.

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

These Quadratics are NEVER factorable.

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

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

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

Factor each of these:

1. $8x^3 + 27$
2. $64x^3 - 125$

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

1. $8x^3 + 27$

$(2x)^3 + (3)^3$

$a = 2x \quad b = 3$

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

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

2. $64x^3 - 125$

$(4x)^3 - (5)$

$a = 4x \quad b = 5$

$(4x-5)(16x^2+20x+25)$

Find all solutions to each equation.

1. $x^3 - 125 = 0$

2. $27x^3 + 64 = 0$

Find all solutions to each equation.

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

1. $x^3 - 125 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = x$

$b = 5$

$(x-5)(x^2+5x+25) = 0$

$x = 5, \quad \frac{-5 \pm 5i\sqrt{3}}{2}$

$b^2 - 4ac = -75$

$\frac{-5 \pm \sqrt{-75}}{2} = \frac{-5 \pm 5i\sqrt{3}}{2}$

2. $27x^3 + 64 = 0$

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

$(3x)^3 + (4)^3 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = 3x$

$b = 4$

$(3x+4)(9x^2-12x+16)$

$b^2 - 4ac = -432$

$\frac{12 \pm \sqrt{-432}}{18}$ $144 \cdot 3$

$\frac{12 \pm 12i\sqrt{3}}{18}$

$x = -\frac{4}{3}, \quad \frac{2 \pm 2i\sqrt{3}}{3}$