

Name: Key

Hour: \_\_\_\_\_

Date: \_\_\_\_\_

# Factoring/Solving Polynomials Using Sum & Difference of Cubes

pRecall the following information:

Sum of Cubes:

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

Difference of Cubes:

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

Quadratic Formula:

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

Imaginary Numbers:

$$i = \sqrt{-1}$$

$$i^2 = -1$$

How do you solve polynomials:

Set each factor equal to zero and solve accordingly!

Examples:

1)  $x^3 - 125 = 0$

$a = x$   $b = 5$

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

$$x - 5 = 0$$

$$\boxed{x = 5}$$

$$x^2 + 5x + 25 = 0$$

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

$$= \frac{-5 \pm \sqrt{25 - 100}}{2}$$

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

$$= \frac{-5 \pm \sqrt{-1} \sqrt{75}}{2}$$

2)  $8x^3 + 27 = 0$   $a = 2x$   $b = 3$

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

$$2x + 3 = 0$$

$$\begin{array}{r} -3 \\ -3 \end{array}$$

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

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

$$4x^2 - 6x + 9 = 0$$

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

$$= \frac{6 \pm \sqrt{36 - 144}}{8}$$

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

$$= \frac{6 \pm \sqrt{-1} \sqrt{36} \sqrt{3}}{8}$$

$$= 6 \pm 6i\sqrt{3} - \boxed{13 + 3i\sqrt{3}}$$