Difference of Perfect Squares

Factor. $49x^2 - 81$ $= (7x+9)(7x-9)$

or $7x \pm 9$

Sum of Perfect Squares Doesn't Factor!

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what are these numbers?

1, 8, 27, 64, 125, ...

Perfect Cubes

Factoring the difference of perfect cubes:

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

Factor the following:

1. $Q^3 - 27$ $= (Q-3)(Q^2+3Q+9)$

   ($a^3 - b^3$)

   $a = Q$

   $b = 3$

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

2. $125m^3 - 216$ $= (5m-6)(25m^2+30m+36)$

   $a = 5m$

   $b = 6$

Is there a way to factor the sum of perfect cubes?

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

Factor the following:

1. $64a^3 + 1 = (4a + 1)(16a^2 - 4a + 1)$

$a = 4a$

$b = 1$

Factor:

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

2. $27c^3 + 8d^3$

$a = 3c$

$b = 2d$

$27c^3 + 8d^3 = (3c + 2d)(9c^2 - 6cd + 4d^2)$

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

These Quadratics are NEVER factorable.

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

When solving the sum or difference of perfect cubes by factoring one solution will come from the first factor, (a - b) or (a + b)

The other two solutions will come from the quadratic factor $(a^2 + ab + b^2)$ or $(a^2 - ab + b^2)$

But, since it isn't factorable you will always need to use the Quadratic Formula.

Find ALL Complex solutions .

$x^3 + 8 = 0$

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

$a = x$
$b = 2$

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

$x = -2$

$b^2 - 4ac = -12$

$= \frac{2 \pm \sqrt{-12}}{2}$

$= \frac{2 \pm 2i\sqrt{3}}{2}$

$x = -2,\ 1 \pm i\sqrt{3}$

Find ALL Complex solutions.

$27x^3 - 64 = 0$

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

$a = 3x$
$b = 4$

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

$x = 4/3$

$b^2 - 4ac = -432$

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

$\frac{-12 \pm 12i\sqrt{3}}{18} = \frac{-2 \pm 2i\sqrt{3}}{3}$

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

You can now finish Hwk #29: Sec 6-4

Page 330 Due Monday

Problems 12, 14, 16, 48, 54, 57