6.4 Part 1 FACTORING POLYNOMIALS

I. Sum and Difference of Two Cubes:
- a) is a binomial,
- b) each term is perfect cube, and
- c) terms are connected by addition or subtraction.

Perfect Cubes:

$1=(1)^3$	$216=(6)^3$	$x^3=(x)^3$	$8x^6=(2x^2)^3$
$8=(2)^3$	$343=(7)^3$	$x^6=(x^2)^3$	$216x^{15}=(6x^5)^3$
$27=(3)^3$	$512=(8)^3$	$x^9=(x^3)^3$	$64x^9=(4x^3)^3$
$64=(4)^3$	$729=(9)^3$	$x^{12}=(x^4)^3$	
$125=(5)^3$	$1000=(10)^3$	$x^{15}=(x^5)^3$	

FACTOR PATTERNS

add.
SUM OF 2 CUBES: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

subt.
DIFFERENCE OF 2 CUBES: $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Examples:

1. $x^3 - 1000$ (diff.)

$(x)^3$ "a" $(10)^3$ "b"

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

$(x-10)(x^2+x\cdot 10+10^2)$

$(x-10)(x^2+10x+100)$

2. $8d^3 + 1$ (sum)

$(2d)^3$ "a" $(1)^3$ "b"

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

$(2d+1)((2d)^2-2d\cdot 1+1^2)$

$(2d+1)(4d^2-2d+1)$

Examples:

3. $64y^3 - 1$ (diff.)

$(4y)^3$ "a" $(1)^3$ "b"

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

$(4y-1)((4y)^2+4y\cdot 1+1^2)$

$(4y-1)(16y^2+4y+1)$

4. $512 + 27k^3$ (sum)

$(8)^3$ "a" $(3k)^3$ "b"

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

$(8+3k)(8^2-8\cdot 3k+(3k)^2)$

$(8+3k)(64-24k+9k^2)$

5. $216m^9 + 125$ (sum)

$(6m^3)^3$ "a" $(5)^3$ "b"

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

$(6m^3+5)((6m^3)^2-6m^3\cdot 5+5^2)$

$(6m^3+5)(36m^6-30m^3+25)$

6. $64 - 343h^3$ (diff.)

$(4)^3$ "a" $(7h)^3$ "b"

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

$(4-7h)(4^2+4\cdot 7h+(7h)^2)$

$(4-7h)(16+28h+49h^2)$