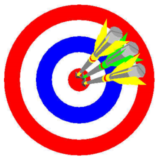
3.7 Factoring a Sum and Difference of Cubes



"I can factor fully any polynomial, including a Sum and Difference of Cubes. I can apply what I have learned in familiar and unfamiliar settings."

Sum of Cubes: $\underset{y}{\triangle}^3 + \boxed{2}^3$

Difference of Cubes: $\underset{2x}{\triangle}^3 - \boxed{3}^3$

Apply the Factor Theorem to factor completely: $B^2 - 4AC < 0$

a) $y^3 + 8$

TM

$= (y+2)(y^2 - 2y + 4)$

$B^2 - 4AC$

$= (-2)^2 - 4(1)(4) < 0$

b) $8x^3 - 27$

$= (x - 1.5)(8x^2 + 12x + 18)$

$= 2(x - 1.5)(4x^2 + 6x + 9)$

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

Predict a formula for a factored Difference of Cubes: $a^3 - b^3$

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

Predict a formula for a factored Sum of Cubes: $a^3 + b^3$

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

The Factor Theorem can be applied to any expression. However, it *may* be more faster to use one of the new formulae if one recognizes the expression as a sum/difference of cubes. Hence, the following algorithm is suggested, from now on, when required to factor:

Is the expression a sum/difference of cubes?
If so, use the appropriate formula. Otherwise, apply the Factor Theorem directly.

MathSIP! pg 182 #2acegi, 3, 4acegi, 5ac, 6
Are you factoring fully?

18a) Consider y and y^2 to be constants, etc. . . .

$$x^2$$

$$x^2+0xy-y^2 \,\big)\, x^4+yx^3+0y^2x^2-y^3x-y^4$$

$$x^4+0yx^3-y^2x^2$$

$$yx^3+y^2x^2-y^3x$$

etc. . . .

p177

#9) $p(x)=12x^3+kx^2-x-6$

if $2x-1$ is a factor then so are $2(x-\frac{1}{2})$!!!

$x-a$

$p(\frac{1}{2})= \qquad\qquad = 0$