Page 346 **Examples from the textbook**

SPECIAL FACTORING PATTERNS

SUM OF TWO CUBES	**Example**
$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$	$x^3 + 8 = (x + 2)(x^2 - 2x + 4)$
DIFFERENCE OF TWO CUBES	
$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$	$8x^3 - 1 = (2x - 1)(4x^2 + 2x + 1)$

EXAMPLE 1 *Factoring the Sum or Difference of Cubes*

Factor each polynomial.

a. $x^3 + 27$ **b.** $16u^5 - 250u^2$

SOLUTION

a. $x^3 + 27 = x^3 + 3^3$ Sum of two cubes

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

b. $16u^5 - 250u^2 = 2u^2(8u^3 - 125)$ Factor common monomial.

$= 2u^2[(2u)^3 - 5^3]$ Difference of two cubes

$= 2u^2(2u - 5)(4u^2 + 10u + 25)$

.....

For some polynomials, you can **factor by grouping** pairs of terms that have a common monomial factor. The pattern for this is as follows.

$$ra + rb + sa + sb = r(a + b) + s(a + b)$$
$$= (r + s)(a + b)$$

EXAMPLE 2 *Factoring by Grouping*

Factor the polynomial $x^3 - 2x^2 - 9x + 18$.

SOLUTION

$x^3 - 2x^2 - 9x + 18 = x^2(x - 2) - 9(x - 2)$ Factor by grouping.

$= (x^2 - 9)(x - 2)$

$= (x + 3)(x - 3)(x - 2)$ Difference of squares

.....

Example 3a can be <u>simplified</u> more with a SOTS problem!

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

EXAMPLE 3 *Factoring Polynomials in Quadratic Form*

Factor each polynomial.

a. $81x^4 - 16$ **b.** $4x^6 - 20x^4 + 24x^2$

SOLUTION

a. $81x^4 - 16 = (9x^2)^2 - 4^2$

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

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

b. $4x^6 - 20x^4 + 24x^2 = 4x^2(x^4 - 5x^2 + 6)$

$= 4x^2(x^2 - 2)(x^2 - 3)$