Unit 2 – Polynomials

Chapter 3.7: Factoring Sum and Difference of Cubes

Some patterns are useful that are worth memorizing. They allow you to work more efficiently and sometimes simplify a much more complicated looking problem.

Recall: **Perfect squares & Difference of Squares**

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

Recall: **Pascal's Triangle and $(\mathbf{a}+\mathbf{b})^{\mathbf{n}}$**

n			
0	$(a+b)^0$	$=$	1
1	$(a+b)^1$	$=$	$a+b$
2	$(a+b)^2$	$=$	$a^2+2ab+b^2$
3	$(a+b)^3$	$=$	$a^3+3a^2b+3ab^2+b^3$
4	$(a+b)^4$	$=$	$a^4+4a^3b+6a^2b^2+4ab^3+b^4$

For $(a-b)^n$, negative coefficients for odd powers of b.

$$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$$
$$(a+b)^4 = a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4$$

Sum and difference of cubes:

- An expression that contains two perfect cubes that are added together is called a sum of cubes and can be factored as follows:

  $A^3 + B^3 = (A + B)(A^2 - AB + B^2)$

- An expression that contains perfect cubes where one is subtracted from the other is called a difference of cubes and can be factored as follows:

  $A^3 - B^3 = (A - B)(A^2 + AB + B^2)$

With higher-order polynomials, look for patterns involving squares or cubes.

For example:

$a^4 - b^4 = (a^2)^2 - (b^2)^2 =$

$x^{12} + y^{12} = (x^3)^4 + (y^3)^4 \; or \; (x^6)^2 + (y^6)^2 \; or \; (x^4)^3 + (y^4)^3 =$

Example 1: Factor $64x^6 - 729$

Example 2: $(x-3)^3 + (3x-2)^3$

Example 3: $x^6 - \frac{1}{64}y^{12}$

Suggested practice from textbook: pg182. # 2ac, 4, 5, 8