

## Lesson 5.7: General Factoring Strategies

**Objectives:** Factor polynomials completely.

We have learned several ways to factor in this unit, today our goal is to learn how to recognize and apply the correct factoring patterns.

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### STEPS FOR FACTORING (no matter what kind of polynomial it is.)

**Step 1:** Factor out the GCF, if there is one.

**Step 2:** Count the number of terms.

**Step 3:** A) 2 terms

- Is it a *difference of squares*?

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

- Is it a *difference of two cubes*?

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

- Is it a *sum of two cubes*?

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

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### Step 3: cont.

#### B) 3 terms

- Is it a perfect square trinomial?

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

or

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

$$\begin{array}{l} \underline{\quad} \cdot \underline{\quad} = ac \\ \underline{\quad} + \underline{\quad} = b \end{array}$$

- Is the coefficient of the  $x^2$  term 1?

$$x^2 + bx + c = (x + m)(x + n)$$

$$\text{where } m \cdot n = c, m + n = b$$

- Is the coefficient of the  $x^2$  term different than a 1?

➤ Then use factoring by grouping.

#### C) 4 terms

- Use factoring by grouping. (Remember: sometimes we can “group” into groups other than pairs, such as perfect square trinomials.)

### Step 4: Check your work!

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Example 1: Factor  $18x^2 + 3x - 3$

$$3(6x^2 + \underbrace{x}_{-2} - 1)$$

$$\begin{array}{l} \underline{3} \cdot \underline{-2} = -6 \\ \underline{3} + \underline{-2} = 1 \end{array}$$

$$3 \left[ \underbrace{6x^2 + 3x}_{3x(2x+1)} - \underbrace{2x - 1}_{-1(2x+1)} \right]$$

$$3 \left[ 3x(2x+1) - 1(2x+1) \right]$$

$$\boxed{3(2x+1)(3x-1)}$$

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Example 2: Factor  $81z^2 - 49y^2$

$$A = 9z \quad B = 7y$$

$$(9z + 7y)(9z - 7y)$$

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Example 3: Factor  $100k^2 + 240k + 144$

$$4(25k^2 + 60k + 36)$$

$$4(5k + 6)^2$$

$$A = 5k$$

$$B = 6$$

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Example 4: Factor  $125m^9 + 8n^6$

$$A = 5m^3$$

$$B = 2n^2$$

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

$$(5m^3 + 2n^2)(25m^6 - 10m^3n^2 + 4n^4)$$

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Example 5: Factor  $-2a^2b + 8ab + 42b$

$$-2b(a^2 - 4a - 21)$$

$$\underline{-7} \cdot \underline{3} = -21$$

$$\underline{-7} + \underline{3} = -4$$

$$\boxed{-2b(a-7)(a+3)}$$



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Example 6: Factor  $6x^3 - 9x^2 - 6x + 9$

$$3 \left( \underbrace{2x^3 - 3x^2}_{x^2(2x-3)} - \underbrace{2x + 3}_{-1(2x+3)} \right)$$

$$3 \left[ x^2(2x-3) - 1(2x+3) \right]$$

$$3(2x-3)(x^2-1)$$

$$3(2x-3)(x+1)(x-1)$$

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Example 7: Factor  $x^2 - 4xy + 4y^2 - 9$

$$A = x \quad B = 2y$$

$$A = x - 2y \quad B = 3$$
$$(x - 2y)^2 - 9$$

$$(x - 2y + 3)(x - 2y - 3)$$

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Can you?

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### Homework:

Pg. 421: #'s 3, 5, 7, 9, 11, 17, 19, 23, 25, 33, 35, 37, 39, 41, 47, 49, 51

AND

Pg. 442-443: #'s 72, 77, 83, 85, 92, 99, 102, 107

