

## 8.3 – 8.4 NOTES

### Square of a Binomial Pattern

Algebra

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

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

Example

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

$$(3x - 2)^2 = 9x^2 - 12x + 4$$

### Sum and Difference Pattern

Algebra

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

Example

$$(x + 5)(x - 5) = x^2 - 25$$

IF YOU DO NOT LEARN THESE IT IS OKAY. JUST DO FOIL METHOD. YOU WILL GET SAME ANSWER.

**GOAL** Solve polynomial equations.

### Vocabulary

The zero-product property is used to solve an equation when one side is zero and the other side is a product of polynomial factors. The solutions of such an equation are also called **roots**.

The height of a projectile can be described by the **vertical motion model**:  $h = -16t^2 + vt + s$ , where  $t$  is the time (in seconds) the object has been in the air,  $v$  is the initial vertical velocity (in feet per second), and  $s$  is the initial height (in feet).

SOLVE THESE BY SEPARATING EACH SET OF PARENTHESES EQUAL TO ZERO.  
THEN, SOLVE FOR THE VARIABLE.

**EXAMPLE 1** **Use the zero-product property**

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Solve  $(x - 3)(x + 6) = 0$ .

**Solution**

$$\begin{array}{ll} (x - 3)(x + 6) = 0 & \text{Write original equation.} \\ x - 3 = 0 \quad \text{or} \quad x + 6 = 0 & \text{Zero-product property} \\ x = 3 \quad \text{or} \quad x = -6 & \text{Solve for } x. \end{array}$$

The roots of the equation are 3 and  $-6$ .

**CHECK** Substitute each root into the original equation to check.

$$\begin{array}{ll} (3 - 3)(3 + 6) \stackrel{?}{=} 0 & (-6 - 3)(-6 + 6) \stackrel{?}{=} 0 \\ 0 \cdot 9 \stackrel{?}{=} 0 & -9 \cdot 0 \stackrel{?}{=} 0 \\ 0 = 0 \checkmark & 0 = 0 \checkmark \end{array}$$

**Exercises for Example 1**

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Solve the equation.

1.  $(m - 7)(m - 9) = 0$

2.  $(5n + 10)(4n + 12) = 0$

**EXAMPLE 2** **Solve an equation by factoring**

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Solve  $6x^2 + 12x = 0$ .

$$\begin{array}{ll} 6x^2 + 12x = 0 & \text{Write original equation.} \\ 6x(x + 2) = 0 & \text{Factor left side.} \\ 6x = 0 \quad \text{or} \quad x + 2 = 0 & \text{Zero-product property} \\ x = 0 \quad \text{or} \quad x = -2 & \text{Solve for } x. \end{array}$$

The roots of the equation are 0 and  $-2$ .

**EXAMPLE 3** **Solve an equation by factoring**

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**Solve  $9y^2 = 21y$ .**

$$9y^2 = 21y \quad \text{Write original equation.}$$

$$9y^2 - 21y = 0 \quad \text{Subtract } 21y \text{ from each side.}$$

$$3y(3y - 7) = 0 \quad \text{Factor left side.}$$

$$3y = 0 \quad \text{or} \quad 3y - 7 = 0 \quad \text{Zero-product property}$$

$$y = 0 \quad \text{or} \quad y = \frac{7}{3} \quad \text{Solve for } y.$$

The roots of the equation are 0 and  $\frac{7}{3}$ .

**Exercises for Examples 2 and 3**

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**Solve the equation.**

**3.**  $q^2 + 16q = 0$

**4.**  $4k^2 - 8k = 0$

**5.**  $12h^2 = 36h$