

## Chapter 5 Section 7 Polynomial Equations and Their Applications

Standard form of a Quadratic Equation

$ax^2 + bx + c = 0$  where a, b, c are real numbers with  $a \neq 0$

Second-degree polynomial equation in x

Solving Quadratic Equations by Factoring

$$x^2 - 12x + 27 = 0$$

Notice that the equation is in Standard Form.

Factor

$$(x - 3)(x - 9) = 0$$

Use the Zero-Product Principle.

If  $AB = 0$ , then  $A = 0$  or  $B = 0$

Therefore

$$x - 3 = 0 \text{ or } x - 9 = 0$$

Solve each equation, and the solution is found.

Example 1: page 382

Solve:  $2x^2 - 5x = 12$

What is the difference between a polynomial and a quadratic equation?

$$2x^2 - 5x - 12$$

$$2x^2 - 5x - 12 = 0$$

Solution of  $ax^2 + bx + c = 0$  and  $y = ax^2 + bx + c$ . How are they related?

Let's look at:  $2x^2 - 5x - 12 = 0$  and  $y = 2x^2 - 5x - 12$ . Graph the function.

Example 2:

a)  $5x^2 = 20x$

c)  $(x - 7)(x + 5) = -20$

Polynomial Equations

Setting two polynomials equal to each other.

The equation is in standard form if one side is 0 and the polynomial on the other side is in standard form, descending powers of the variable.

Example:

$$x^3 + x^2 - 4x - 4 = 0$$

Solve polynomial equations.

Rewrite in standard form then factor.

$$4x^2 = 12x - 9$$

Applications of Polynomial Equations

Example 4: page 386.

You throw a ball straight up from a rooftop 384 feet high with an initial speed of 32 feet per second. The function,

$$s(t) = -16t^2 + 32t + 384$$

describes the ball's height above the ground,  $s(t)$ , in feet,  $t$  seconds after you throw it. The ball misses the rooftop on its way down and eventually strikes the ground. How long will it take for the ball to hit the ground?

The Pythagorean Theorem.

$$(\text{leg})^2 + (\text{leg})^2 = (\text{hypotenuse})^2 \text{ Need a right triangle.}$$