

Lesson 9-5

Objective - To solve quadratic and other polynomial equations using the factoring method.

Linear Equations

$$\begin{array}{r} 5x - 10 = 0 \\ +10 \quad +10 \\ \hline 5x = 10 \\ \frac{5}{5} \quad \frac{10}{5} \\ \hline x = 2 \end{array}$$

Quadratic Equations

$$\begin{array}{r} x^2 - 5x = 0 \\ x(x - 5) = 0 \\ x = 0 \text{ or } (x - 5) = 0 \\ x = 0 \text{ or } x = 5 \end{array}$$

Zero Product Property

If $a \bullet b = 0$, then $a = 0$ or $b = 0$.

Standard Form of the Quadratic Equation

$$ax^2 + bx + c = 0$$

Solve.

$$\begin{array}{r} 4x^2 = 36 \\ \underline{-36 \quad -36} \\ 4x^2 - 36 = 0 \\ 4(x^2 - 9) = 0 \\ 4(x+3)(x-3) = 0 \\ \begin{array}{r} x+3=0 \quad x-3=0 \\ \underline{-3 \quad -3} \quad \underline{+3 \quad +3} \\ x=-3 \quad x=3 \end{array} \\ \{-3, 3\} \end{array}$$

Steps

- 1) Set quadratic in standard form in order to use Zero Product Property.
- 2) Factor completely.
- 3) Set each variable factor equal to zero.
- 4) Solve.

Use the Zero Product Property to solve for x.

$$\begin{array}{ll} 1) (x-4)(x+7) = 0 & 3) 3x(x-1)(x+4) = 0 \\ x-4 = 0 \text{ or } x+7 = 0 & x = 0 \text{ or } x = 1 \text{ or } x = -4 \\ x = 4 \text{ or } x = -7 & \{-4, 0, 1\} \\ \{-7, 4\} & \end{array}$$

$$\begin{array}{ll} 2) x(x+3) = 0 & 4) x(2x-5) = 0 \\ x = 0 \text{ or } x+3 = 0 & x = 0 \text{ or } 2x-5 = 0 \\ x = 0 \text{ or } x = -3 & \begin{array}{r} +5 \quad +5 \\ \hline 2x = 5 \\ x = \frac{5}{2} \end{array} \\ \{-3, 0\} & \left\{0, \frac{5}{2}\right\} \end{array}$$

Solve each equation by employing the Zero Product Property.

$$\begin{array}{ll} 1) (x+2)(x-7) = 0 & 3) 2x(x+1)(x+2) = 0 \\ x = -2 \text{ or } x = 7 & x = 0 \text{ or } x = -1 \text{ or } x = -2 \\ \{-2, 7\} & \{-2, -1, 0\} \\ 2) x(3x-7) = 0 & 4) (x-3)(4x+1) = 0 \\ x = 0 \text{ or } 3x-7 = 0 & x = 3 \text{ or } 4x+1 = 0 \\ \begin{array}{r} +7 \quad +7 \\ \hline 3x = 7 \\ x = \frac{7}{3} \end{array} & \begin{array}{r} -1 \quad -1 \\ \hline 4x = -1 \\ x = -\frac{1}{4} \end{array} \\ \left\{0, \frac{7}{3}\right\} & \left\{3, -\frac{1}{4}\right\} \end{array}$$

Solve each equation below.

$$\begin{array}{ll} 5) x^3 - 100x = 0 & 6) x^2 - 10x + 25 = 0 \\ x(x^2 - 100) = 0 & (x-5)(x-5) = 0 \\ x(x+10)(x-10) = 0 & x = 5 \\ x = 0 \text{ or } -10 \text{ or } 10 & \{5\} \\ \{-10, 0, 10\} & \end{array}$$

Solve each equation below.

$$\begin{array}{ll} 7) 5n^3 + 30n^2 = -45n & 8) 4x^3 = 49x \\ \underline{+45n \quad +45n} & \underline{-49x \quad -49x} \\ 5n^3 + 30n^2 + 45n = 0 & 4x^3 - 49x = 0 \\ 5n(n^2 + 6n + 9) = 0 & x(4x^2 - 49) = 0 \\ 5n(n+3)(n+3) = 0 & x(2x+7)(2x-7) = 0 \\ n = 0 \text{ or } -3 & x = 0 \text{ or } -\frac{7}{2} \text{ or } \frac{7}{2} \\ \{-3, 0\} & \left\{-\frac{7}{2}, 0, \frac{7}{2}\right\} \end{array}$$

Lesson 9-5 (cont.)

Solve.

$$9) x^2 + 3x - 25 = 7x + 20$$

$$\begin{array}{r} x^2 + 3x - 25 = 20 \\ -7x \quad -7x \\ \hline x^2 - 4x - 25 = 20 \\ -20 \quad -20 \\ \hline \end{array}$$

$$x^2 - 4x - 45 = 0$$

$$(x+5)(x-9) = 0$$

$$x = -5 \text{ or } x = 9$$

$$\{-5, 9\}$$

Solve.

$$10) x(2x - 5) = (x + 2)(x - 6) + 24$$

$$2x^2 - 5x = x^2 - 4x - 12 + 24$$

$$\begin{array}{r} 2x^2 - 5x = x^2 - 4x - 12 + 24 \\ -x^2 \quad -x^2 \\ \hline \end{array}$$

$$x^2 - 5x = -4x + 12$$

$$\begin{array}{r} x^2 - 5x = -4x + 12 \\ +4x \quad +4x \\ \hline \end{array}$$

$$x^2 - x = 12$$

$$\begin{array}{r} x^2 - x = 12 \\ -12 \quad -12 \\ \hline \end{array}$$

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

$$(x+3)(x-4) = 0$$

$$x = -3 \text{ or } x = 4$$

$$\{-3, 4\}$$