Section 6.8 Solving Equations by Factoring and Problem Solving

# Objective 1: Solving Polynomial Equations by Factoring

A **polynomial equation** is the result of setting two polynomial expressions equal to each other. For example, $3x^{3}-2x^{2}=x^{2}+2x-1$ is a polynomial equation.

A polynomial equation is in **standard form** if one side of the equation is $0$ and the other side is a polynomial expression in standard form. For example, $3x^{3}-3x^{2}-2x+1=0$ is a polynomial equation in standard form.

The degree of a polynomial equation in standard form is the highest degree of any of its terms. So $3x^{3}-3x^{2}-2x+1=0$ is a degree $3$ polynomial equation. A quadratic equation can also be called a degree $2$ polynomial equation.

One method of solving a polynomial equation written in standard form is to factor the polynomial expression and apply the zero-factor property.

**Zero-Factor Property:** If $a$ and $b$ are real numbers and $ab=0$, then $a=0$ or $b=0$ or both.

Solve the equation.

|  |  |
| --- | --- |
| a. $3\left(x-8\right)\left(x+4\right)\left(2x+7\right)=0$ | b. $8r^{3}+32r^{2}=96r$ |

|  |  |
| --- | --- |
| c. $x^{3}-x=12x^{2}-12$ | d. $n^{4}-13n^{2}+36=0$ |

# Objective 2: Solving Problems Modeled by Polynomial Equations

Some application problems may be modeled by polynomial equations. When solving these problems, keep in mind that a solution of an equation that models a problem is not always a solution to the problem.

The shorter leg of a right triangle is $6$ centimeters less than the other leg. Find the length of the two legs if the hypotenuse is $30$ centimeters.