

# Algebra 1

## Lesson 9.4B

### Solve Polynomial Equations in Factored Form

#### Warm-Up

Factor each of the following by finding the Greatest Common Factor.

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

$$3x(x^2 + 3x + 2)$$

(b)  $12b^2 - 8b + 16$

$$4(3b^2 - 2b + 4)$$

Solve each linear equation.

(c)  $x - 4 = 0$

$$\begin{array}{r} +4 \quad +4 \\ \hline x = 4 \end{array}$$

(d)  $2x + 1 = 0$

$$\begin{array}{r} -1 \quad -1 \\ \hline 2x = -1 \\ \hline x = -\frac{1}{2} \end{array}$$

$(a)(b) = 0$

$a = 0$  or  $b = 0$

(e)  $3x - 6 = 0$

$$\begin{array}{r} +6 \quad +6 \\ \hline 3x = 6 \\ \hline \frac{3x}{3} = \frac{6}{3} \\ \hline x = 2 \end{array}$$

**Example 1. Use the Zero Product Property**  
Solve each equation.

(a)  $(x+2)(x-4) = 0$

$$\begin{array}{r} \swarrow \quad \searrow \\ x+2=0 \quad \text{or} \quad x-4=0 \\ -2 \quad -2 \quad \quad +4 \quad +4 \\ \hline x = -2 \quad \text{or} \quad x = 4 \end{array}$$

(b)  $(4x+1)(x+3) = 0$

$$\begin{array}{r} \swarrow \quad \searrow \\ 4x+1=0 \quad \text{or} \quad x+3=0 \\ -1 \quad -1 \quad \quad -3 \quad -3 \\ \hline 4x = -1 \\ \hline x = -\frac{1}{4} \quad \text{or} \quad x = -3 \end{array}$$

**Example 2. Solve by Finding the Greatest Common Factor (GCF)**  
Factor out the GCF then use the Zero Product Property to solve each equation.

(a)  $x^2 - 6x = 0$

$$x(x-6) = 0$$

$$\begin{array}{r} \swarrow \quad \searrow \\ x=0 \quad \text{or} \quad x-6=0 \\ \quad \quad \quad +6 \quad +6 \\ \hline x = 6 \end{array}$$

**Try It!**  
Solve.

(a)  $(m-8)(m+1) = 0$

$$m = 8 \quad \text{or} \quad m = -1$$

(c)  $a^2 + 5a = 0$

$$a(a+5) = 0$$

$$a = 0 \quad \text{or} \quad a = -5$$

(b)  $3x^2 + 18x = 0$

$$3x(x+6) = 0$$

$$\begin{array}{r} \swarrow \quad \searrow \\ 3x=0 \quad \text{or} \quad x+6=0 \\ \frac{3x}{3} = \frac{0}{3} \quad \quad -6 \quad -6 \\ \hline x = 0 \quad \text{or} \quad x = -6 \end{array}$$

(b)  $(3x+5)(2x-3) = 0$

$$\begin{array}{r} \swarrow \quad \searrow \\ 3x+5=0 \quad \text{or} \quad 2x-3=0 \\ -5 \quad -5 \quad \quad +3 \quad +3 \\ \hline 3x = -5 \quad \text{or} \quad 2x = 3 \\ \hline \frac{3x}{3} = \frac{-5}{3} \quad \text{or} \quad \frac{2x}{2} = \frac{3}{2} \end{array}$$

(d)  $4x^2 - 2x = 0$

$$2x(2x-1) = 0$$

$$x = 0 \quad \text{or} \quad x = \frac{1}{2}$$

$$x = -\frac{5}{3} \quad \text{or} \quad x = \frac{3}{2}$$

**Example 3. Setting an Equation to Zero Before Factoring**

Solve.

(a)  $4s^2 = 14s$   
 $-14s \quad -14s$

$s=0$  or  $s=\frac{7}{2}$

(b)  $28m^2 = 8m$   
 $-8m \quad -8m$

$m=0$  or  $m=\frac{2}{7}$

$4s^2 - 14s = 0$

$(2s)(2s-7) = 0$

$\frac{2s}{2} = 0$  or  $2s-7=0$   
 $\frac{2s}{2} = 0$  or  $\frac{2s}{2} = \frac{7}{2}$   
 $s=0$  or  $s=\frac{7}{2}$

Try It!  
Solve.

(a)  $t^2 + 2t = 0$

$t(t+2) = 0$

$t=0$  or  $t=-2$

(b)  $3x^2 = -9x$

$3x^2 + 9x = 0$

$3x(x+3) = 0$

$x=0$  or  $x=-3$

$\frac{7m}{7} = \frac{2}{7}$

(c)  $10n^2 = 35n$

$10n^2 - 35n = 0$

$5n(2n-7) = 0$

$n=0$  or  $n=\frac{7}{2}$

(d)  $(x+1)(x-9) = 0$

$x=-1$  or  $x=9$

(e)  $(4n+6)(n-4) = 0$

$n=-\frac{3}{2}$  or  $n=4$

(f)  $18x^2 + 6x = 0$

$6x(3x+1) = 0$

$x=0$  or  $x=-\frac{1}{3}$

**Assignment**

New: Pg. 578 #4 - 38 (evens)

**Review:**

1.  $(3x^2 + 7x^3 - 5x + 6) + (2x^3 - 5x^2 - 6x - 7)$

2.  $(3x^2 + 8x - 7) - (6x + 2 - 3x^2)$

3.  $(2x + 1)(3x - 4)$

4.  $(4x + 2)^2$

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