Section 9.4 Polynomial Equations in Factored Form

Goal • Solve polynomial equations.

Zero Product Property

Let a and b be real numbers. If $ab = 0$ then $a = 0$ or $b = 0$

Example 1: Solve each equation by using the zero product property.

a. $(x + 3)(x - 2) = 0$

$(x+3)=0$ $\quad -3 \ -3$ $\quad \boxed{x=-3}$ $\qquad (x-2)=0$ $\quad +2 \ +2$ $\quad \boxed{x=2}$

b. $(x - 5)(x - 1) = 0$

$x-5=0$ $\quad +5 \ +5$ $\quad \boxed{x=5}$ $\qquad x-1=0$ $\quad +1 \ +1$ $\quad \boxed{x=1}$

c. $3x^2 (x - 2) = 0$

$\frac{3x^2}{3} = \frac{0}{3}$ $\quad x^2 = 0$ $\quad \boxed{x=0}$ $\qquad x-2=0$ $\quad +2 \ +2$ $\quad \boxed{x=2}$

d. $(3x - 5)(2x - 1) = 0$

$3x-5=0$ $\quad +5 \ +5$ $\quad \frac{3x}{3} = \frac{5}{3}$ $\quad \boxed{x=5/3}$ $\qquad 2x-1=0$ $\quad +1 \ +1$ $\quad \frac{2x}{2} = \frac{1}{2}$ $\quad \boxed{x=1/2}$

These solutions are called **ROOTS**

Example 2: Factor out the greatest common monomial factor

a. $12x + 42y$

GCF : 6

$\boxed{6(2x+7y)}$

b. $4x^4 + 24x^3 \rightarrow 4xxxx + 24xxx$

GCF : $4x^3$

$\boxed{4x^3(x+6)}$

Checkpoint

1. Solve each equation.

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

$x+6=0$ $\quad \boxed{x=-6}$ $\qquad x-3=0$ $\quad \boxed{x=3}$

b. $(x - 8)(x - 5) = 0$

$x-8=0$ $\quad \boxed{x=8}$ $\qquad x-5=0$ $\quad \boxed{x=5}$

2. Factor out the greatest common monomial factor.

a. $10x^2 - 24y^2$

GCF : 2

$\boxed{2(5x^2-12y^2)}$

b. $3t^6 + 8t^4 \rightarrow 3tttttt + 8tttt$

GCF : t^4

$\boxed{t^4(3t^2+8)}$

Section 9.4 Polynomial Equations in Factored Form

Steps to Solving Polynomials in Factored Form
Step 1: Factor out greatest common monomial
Step 2: Use the zero product property

Example 3: Solve an equation by Factoring.

a. $12x^2 + 8x = 0$

GCF: $4x$

$4x(3x+2) = 0$

$4x = 0$ $\quad$ $3x+2=0$

$x = 0$ $\quad$ $x = -2/3$

b. $6n^2 = 15n$

$6n^2 - 15n = 0$

GCF: $3n$

$3n(2n-5) = 0$

$3n = 0$ $\quad$ $2n-5=0$

$n = 0$ $\quad$ $n = 5/2$

Checkpoint: Solve each equation.

3. $d^2 - 7d = 0$

GCF: $d(d-7) = 0$

$d = 0$ $\quad$ $d-7=0$

$d = 7$

4. $8b^2 = 2b$

$8b^2 - 2b = 0$

GCF: $2b$

$2b(4b-1) = 0$

$2b = 0$ $\quad$ $4b-1=0$

$b = 0$ $\quad$ $b = 1/4$

Polynomial	GCF	Factored Form
$5x^2 + 10x$	$5x$	$5x(x + 2)$
$6x + 12$	6	$6(x+2)$
$b^3 + 3b^2$	b^2	$b^2(b+3)$
$3y^3 - 3y$	$3y$	$3y(y^2-1)$
$6m^5 - 21m^4 - 15m^2$	$3m^2$	$3m^2(2m^3 - 7m^2 - 5)$