# Solving Quadratic Equations Using Factoring

Once polynomials have been factored, we may begin to solve for their critical points before they are graphed. These points would include such things as x and y intercepts and flex points. To accomplish this, the equation is first set equal to zero and then each of the factors are solved for the appropriate variable.

**Example 1.** **Solve $x^2 + 5x + 6$ for x.**

**Step 1.** Set the equation equal to zero.

$x^2 + 5x + 6 = 0$

**Step 2.** Factor the polynomial (see 4.6)

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

**Step 3.** Set each term equal to zero.

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

**Step 4.** Solve for the indicated variable.

$x + 2 = 0$ or $x + 3 = 0$

$x = - 2$ or $x = - 3$

The solution set for this problem is $\{ - 2 , - 3 \}$

**Example 2. Solve $x^2 – 5x + 6$ for x.**

**Step 1.** $x^2 – 5x + 6 = 0$

**Step 2.** $( x – 2 ) ( x – 3 ) = 0$

**Step 3.** $( x – 2 ) = 0$ or $( x – 3 ) = 0$

**Step 4.** $x – 2 = 0$ or $x – 3 = 0$

$x = 2$ or $x = 3$

$\{ 2 , 3 \}$

**Example 3.** **Solve $x^2 + 6x + 9$ for x.**

**Step 1.** $x^2 + 6x + 9 = 0$

**Step 2.** $( x + 3 ) ( x + 3 ) = 0$

**Step 3.** $x + 3 = 0$ or $x + 3 = 0$

**Step 4.** $x = - 3$ or $x = - 3$

$\{ - 3 \}$

**Note:** The solutions for this equation are both – 3 . When the same solution is found a number of times it is said to have a zero of multiplicity however many times that value is repeated. In this example it is said that the equation has "*a zero of – 3 of multiplicity 2*".