

## Solving Quadratic Equations using the Quadratic Formula

There are many techniques for solving quadratic equations. Completing the square will solve any quadratic equation, but it is not very efficient. The most efficient method for solving quadratic equations is to use the quadratic formula.

### The Quadratic Formula

The standard quadratic equation has the form  $ax^2 + bx + c = 0$ . The solution for this type of equation can be found by the following formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Examples:

$$\text{Solve } 3x^2 - 4x + 1 = 0$$

$$a = 3, b = -4, c = 1$$

therefore we get

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(1)}}{2(3)}$$

$$x = \frac{4 \pm \sqrt{16 - 12}}{6}$$

$$x = \frac{4 \pm \sqrt{4}}{6}$$

$$x = \frac{4 \pm 2}{6}$$

$$x = \frac{4 + 2}{6} \text{ or } x = \frac{4 - 2}{6}$$

$$x = 1 \text{ or } x = \frac{1}{3}$$

Solve  $2x^2 + 3x - 1 = 0$   
 $a = 2, b = 3, c = -1$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(-1)}}{2(2)}$$

$$x = \frac{-3 \pm \sqrt{9+8}}{4}$$

$$x = \frac{-3 \pm \sqrt{17}}{4}$$

$$x = \frac{-3 + \sqrt{17}}{4} \text{ or } x = \frac{-3 - \sqrt{17}}{4}$$