Solving a Quadratic Equation by *Completing the Square*

Example: $\mathbf{2x^2 - 3x + 9 = 0}$

Step 1: If the coefficient of x^2 is 1, the go to Step 2. Otherwise, divide (or factor out) all terms by the coefficient of x^2.

$$\frac{2}{2}x^2 - \frac{3}{2}x + \frac{9}{2} = \frac{0}{2}$$

$$x^2 - \frac{3}{2}x + \frac{9}{2} = 0$$

Step 2: Isolate all variable terms on one side of the equation**.**

$$x^2 - \frac{3}{2}x = -\frac{9}{2}$$

Step 3: Complete the Square for the resulting binomial by using the following two sub-steps:

a.) Multiply the coefficient of the x term by $\frac{1}{2}$

$$-\frac{3}{2} * \frac{1}{2} = -\frac{3}{4}$$

b.) Square the result of a.) and add it to both sides of the equation.

$$\left(-\frac{3}{4}\right)^2 = \frac{9}{16}$$

$$x^2 - \frac{3}{2}x + \frac{9}{16} = -\frac{9}{2} + \frac{9}{16}$$

Note: the left side is now a *Perfect Square Trinomial (P.S.T.)*.

Step 4: Factor the resulting P.S.T. by writing it as the square of a Binomial.

$$\left(x - \frac{3}{4}\right)^2 = -\frac{63}{16}$$

Step 5: Use the *Square Root Property* to solve for x.

$$\sqrt{\left(x-\frac{3}{4}\right)^2}=\pm\sqrt{-\frac{63}{16}}$$

$$x-\frac{3}{4}=\pm i\frac{\sqrt{63}}{\sqrt{16}}$$

$$x-\frac{3}{4}=\pm i\frac{3\sqrt{7}}{4}$$

$$x=\frac{3}{4}\pm\frac{3}{4}\sqrt{7}\ \text{ or } x=\frac{3\pm i3\sqrt{7}}{4}$$

Step 6: Check!

Also, see the following Wikipedia link: https://en.wikipedia.org/wiki/Completing_the_square