Algebra 2

Ch. 5   Handout 5.7

Completing the Square

Completing the Square is a process for

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Steps to solving a quadratic equations by Completing the Square

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1. Set Quadratic Equation equal to zero.
2. Move constant to other side. QT + LT = C
3. If $a \neq 1$ divide through by a.
4. Take $\left(\dfrac{1}{2} \left(\dfrac{b}{a} \right) \right)^2$ and add to both sides.

   Completing the Square Process
5. Factor left side and simplify right side.
6. Take the square root of both sides
7. Simplify each side.
8. Solve for x.

Solve the quadratic equation.

$$x^2 + 6x + 12 = 0$$

$$-12 \quad -12$$

$$\frac{1}{2}(6) = (3)^2$$

$$x^2 + \boxed{6}x + (3)^2 = -12 + (3)^2$$

$$(x+3)(x+3) = -12 + 9$$

$$\sqrt{(x+3)^2} = \pm\sqrt{-3}$$

$$\sqrt{-1 \cdot 3}$$

$$x + 3 = \pm i\sqrt{3}$$
$$-3 \quad -3$$

$$\boxed{x = -3 \pm i\sqrt{3}} \quad \text{or} \quad \boxed{\begin{array}{l} x = -3 + i\sqrt{3} \\ x = -3 - i\sqrt{3} \end{array}}$$

Solve the quadratic equation.

$$x^2 - 12x + 36 = 9$$

$$-36 \quad -36$$

$$\frac{1}{2}(12) = (6)^2$$

$$x^2 - \boxed{12}x + (6)^2 = -27 + (6)^2$$

$$(x-6)(x-6) = -27 + 36$$

$$\sqrt{(x-6)^2} = \pm\sqrt{9}$$

$$x - 6 = \pm 3$$
$$+6 \quad +6$$

$$x = 6 \pm 3$$

$$x = 6 + 3$$
$$x = 6 - 3$$

$$\boxed{\begin{array}{c} x = 9 \\ x = 6 \end{array}}$$

Solve the quadratic equation.

$$2x^2 = -7x + 1$$

$$+7x \qquad +7x$$

$$\frac{2x^2}{2} + \frac{7x}{2} = \frac{1}{2}$$

$$\frac{1}{2}\left(\frac{7}{2}\right) = \left(\frac{7}{4}\right)^2$$

$$x^2 + \boxed{\frac{7}{2}}x + \left(\frac{7}{4}\right)^2 = \frac{1}{2} + \left(\frac{7}{4}\right)^2$$

$$\left(x + \frac{7}{4}\right)\left(x + \frac{7}{4}\right) = \frac{1(8)}{2(8)} \cdot \frac{49}{16}$$

$$\sqrt{\left(x + \frac{7}{4}\right)^2} = \pm\sqrt{\frac{57}{16}} \qquad \frac{\sqrt{57}}{\sqrt{16}}$$

$$x + \frac{7}{4} = \pm \frac{\sqrt{57}}{4}$$

$$\boxed{x = \frac{-7}{4} \pm \frac{\sqrt{57}}{4}} \quad \text{or} \quad \boxed{\begin{array}{l} x = \frac{-7}{4} + \frac{\sqrt{57}}{4} \\[2mm] x = \frac{-7}{4} - \frac{\sqrt{57}}{4} \end{array}}$$