

Solving Quadratics By Completing the Square

Note Title

3/6/2009

Objective: To solve quadratic equations by completing the square.

$$1x^2 + 4x - 12 = 0$$

$x^2 + 4x + 4 = 12 + 4$

$$(x+2)(x+2) = 16$$

$$\sqrt{(x+2)^2} = \sqrt{16}$$

$$x+2 = \pm 4$$
$$-2 \quad -2$$

$$x = 2 \quad x = -6$$

- 1) Isolate "c".
- 2) Check "a". If a=1
- 3) Find b. Half it. Square that. Add to both sides.
- 4) Factor as a perfect square trinomial.
- 5) Solve by $\sqrt{\quad}$. Remember \pm ! ! ! ! .

$$a) \quad 1x^2 + 4x + 11 = 0$$

(:)

$$x^2 + 4x + 4 = -11 + 4$$

(2)

$$(x+2)(x+2) = -7$$

$$\sqrt{(x+2)^2} = \sqrt{-7}$$

$$x+2 = \pm i\sqrt{7}$$

$$-2 \quad -2$$

$$x = -2 \pm i\sqrt{7}$$

3)

$$2x^2 + 5x + 6 = 0$$
$$\frac{2x^2}{2} + \frac{5x}{2} = -\frac{6}{2}$$

$$\frac{5}{2} \left(\frac{1}{2}\right) = \boxed{\frac{5}{4}}$$
$$\left(\frac{5}{4}\right)^2 = \frac{25}{16}$$

$$x^2 + \frac{5}{2}x + \frac{25}{16} = -3 + \frac{25}{16}$$

$$\left(x + \frac{5}{4}\right)\left(x + \frac{5}{4}\right) = \frac{-48 + 25}{16}$$

$$\frac{-3\left(\frac{16}{16}\right) = -\frac{48}{16} + \frac{25}{16}}$$

$$\sqrt{\left(x + \frac{5}{4}\right)^2} = \sqrt{\frac{-23}{16}}$$
$$x + \frac{5}{4} = \pm \frac{i\sqrt{23}}{4}$$
$$\cancel{x + \frac{5}{4}} = \pm \frac{-5}{4}$$

$$x = \frac{-5 \pm i\sqrt{23}}{4}$$

You try: $2x^2 - 3x - 3 = 0$

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

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

$\left(\frac{-3}{2}\right)\left(\frac{1}{2}\right) = \frac{-3}{4}$

$$1x^2 + 6x + 2 = 0 \quad x^2 - \frac{3}{2}x + \frac{9}{16} = \frac{3}{2(8)} + \frac{9}{16}$$

$$\left(x - \frac{3}{4}\right)\left(x - \frac{3}{4}\right) = \frac{24}{16} + \frac{9}{16}$$

$$\sqrt{\left(x - \frac{3}{4}\right)^2} = \sqrt{\frac{33}{16}}$$

$$x - \frac{3}{4} = \pm \sqrt{\frac{33}{4}}$$

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

$$x - \frac{3}{4} = \pm \sqrt{\frac{33}{16}}$$

$$x = \frac{3 \pm \sqrt{33}}{4}$$

$$\frac{6}{7} \cdot \frac{1}{2} = \frac{6}{14} = \boxed{\frac{3}{7}}$$

a b c

$$7x^2 + 6x + 2 = 0$$

$$\left(\frac{3}{7}\right)^2 = \frac{9}{49}$$

$$\frac{7x^2}{7} + \frac{6x}{7} = -\frac{2}{7}$$

$$-\frac{2}{7} \cdot \frac{7}{7} = -\frac{14}{49} + \frac{9}{49}$$

$$x^2 + \frac{6x}{7} + \frac{9}{49} = -\frac{2}{7} + \frac{9}{49}$$

$$\sqrt{\left(x + \frac{3}{7}\right)^2} = \sqrt{\frac{-5}{49}}$$

$$x + \frac{3}{7} = \frac{\pm i\sqrt{5}}{\frac{7}{\sqrt{49}}}$$

$$x = \frac{-3 \pm i\sqrt{5}}{7}$$