WARMUP

Solve

$x^2 = 16$ $\quad x = 4, -4$ since $4^2 = 16$ and $(-4)^2 = 16$

$x^2 = -25 \Rightarrow x = \pm\sqrt{-25} = \pm i\sqrt{25} = \pm i5$
$= \pm 5i$

$\frac{\cancel{5}x^2}{\cancel{5}} = \frac{85}{5}$

$x^2 = 17$

$x = \pm\sqrt{17}$

Section 11.1 The Square Root Property and Completing the Square

If $u^2 = d$ then $\underbrace{u = \sqrt{d} \text{ or } u = -\sqrt{d}}_{\text{or } u = \pm\sqrt{d}}$

ex: $\frac{\cancel{4}x^2}{\cancel{4}} = \frac{28}{4}$

$x^2 = 7$

$x = \pm\sqrt{7}$

$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

ex: $4x^2 + 9 = 0$

$\frac{\cancel{4}x^2}{\cancel{4}} = -\frac{9}{4}$

$x^2 = -\frac{9}{4}$

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

$x = \pm i\sqrt{\frac{9}{4}} = \pm i\frac{3}{2}$

$x = \pm\frac{3}{2}i$

ex: $(x-3)^2 = 10$

$$x - \cancel{3} = \pm\sqrt{10}$$
$$+\cancel{3} \qquad +3$$
$$x = 3 \pm \sqrt{10}$$

Completing the Square:

means to make a perfect square trinomial

$$(x+4)^2 = \underbrace{x^2 + 8x + 16}$$

	x	4
x	x^2	$4x$
4	$4x$	16

perfect square trinomial (p.s.t) since it can be written as a binomial squared.

What would you add to $x^2 + 10x + \underline{25}$ to make it a p.s.t.

$= (x+5)^2$

	x	5
x	x^2	$5x$
5	$5x$	25

How about $x^2 - 12x + \underline{36} = (x-6)^2$

$\frac{-12}{2} = -6$, $(-6)^2 = 36$

How about $x^2 - 14x + \underline{49} = (x - 7)^2$

$\left(\frac{-14}{2}\right)^2$ $\qquad$ $\frac{-14}{2}$

Completing the square

$$x^2 + bx + \underline{\qquad} = (x + \quad)^2$$

$\left(\frac{b}{2}\right)^2$ $\qquad$ $\frac{b}{2}$

Solve $x^2 + 4x - 1 = 0$ by completing the square.

<u>STEP 1</u>: Put constant on other side.

$$x^2 + 4x \cancel{-1} = 0$$
$$\cancel{+1} \quad +1$$
$$x^2 + 4x = 1$$

<u>STEP 2</u>: Make left side a p.s.t. by completing the square. Add that number to both sides

$$x^2 + 4x + 4 = 1 + 4$$

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

4
2 2
4

<u>STEP 3</u>: Factor the P.s.t. and simplify right hand side.

$$(x + 2)^2 = 5$$

<u>STEP 4</u>: Square root both sides

$$x+2 = \pm\sqrt{5}$$

<u>STEP 5</u> : Get x by itself and simplify

$$x+\cancel{2} = \pm\sqrt{5}$$
$$\cancel{-2} \qquad -2$$
$$x = -2 \pm \sqrt{5}$$

<u>ex</u>: $x^2 - 4x \cancel{+8} = 0$

$$\cancel{-8} \qquad -8$$

$$x^2 - 4x + \underline{4} = -8 + \underline{4}$$

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

$$\begin{array}{ccc} & 4 & \\ -2 & & -2 \\ & -4 & \end{array}$$

$$(x-2)^2 = -4$$

$$x-\cancel{2} = \pm\sqrt{-4}$$
$$\cancel{+2} \qquad +2$$

$$x = 2 \pm \sqrt{-4} = 2 \pm i\sqrt{4} = 2 \pm 2i$$