

Completing The Square

Steps:

1. Rewrite the equation in the form

$$x^2 + bx = c$$

(note: leading coefficient is 1)

2. Add $\left(\frac{b}{2}\right)^2$ to both sides

3. Factor the left side as $\left(x + \frac{b}{2}\right)^2$

4. Take the $\sqrt{\quad}$ of the left side
Take the $\pm\sqrt{\quad}$ of the right side

5. Solve for x .

Example: $4x^2 - 3 = 16x$

$$4x^2 - 16x = 3$$

$$x^2 - 4x = \frac{3}{4}$$

$$x^2 - 4x + 4 = \frac{19}{4}$$

$$(x - 2)^2 = \frac{19}{4}$$

$$x - 2 = \pm\sqrt{\frac{19}{4}}$$

$$x = \frac{\pm\sqrt{19}}{2} + 2$$

$$x = \frac{\sqrt{19} + 4}{2} \quad \text{or} \quad x = \frac{-\sqrt{19} + 4}{2}$$

$$x \approx 4.179 \quad \text{or} \quad x \approx -1.179$$

Try some:

$$x^2 + 8x + 1 = 0$$

$$\text{answer: } x = \pm\sqrt{15} - 4$$

$$3x^2 = 6x + 5$$

$$\text{answer: } x = \pm 2\sqrt{\frac{2}{3}} + 1$$

$$\text{or } x = \pm\sqrt{\frac{8}{3}} + 1$$

$$x^2 + 2 = 2$$

$$\text{answer: } x = 1 \quad \text{or} \quad x = -2$$