

10.5 - Completing the Square

Vocabulary:

- Perfect Square
- Factoring

$$\begin{array}{c} (x+3)(x+3) = x^2 + 6x + 9 \\ \text{OR} \\ (x+3)^2 \end{array}$$

1 EXAMPLE Find the value of c to complete the square for $x^2 - 16x + c$.

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

$$\left(\frac{-16}{2}\right)^2$$

$$(-8)^2$$

$$c = 64$$

$$x^2 + 14x + \underline{\quad ? \quad}$$

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

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

$$(7)^2$$

$$\boxed{49}$$

2 EXAMPLESolve the equation $x^2 + 5x = 50$.

$$\frac{50 \cdot 4}{1 \cdot 4} = \frac{200}{4}$$

$$b=5$$

$$\left(\frac{5}{2}\right)^2$$

$$(2.5)^2$$

$$6.25$$

$$+\left(\frac{5}{2}\right)^2 + \left(\frac{5}{2}\right)^2$$

$$x^2 + 5x + \left(\frac{5}{2}\right)^2 = 50 + \left(\frac{5}{2}\right)^2$$

$$\left(x + \frac{5}{2}\right)^2 = \frac{200}{4} + \frac{25}{4}$$

$$\sqrt{\left(x + \frac{5}{2}\right)^2} = \sqrt{\frac{225}{4}} \quad \text{solve}$$

$$x + \frac{5}{2} = \pm \frac{15}{2}$$

$$x + \frac{5}{2} = \frac{15}{2}$$

$$-\frac{5}{2}$$

$$\frac{10}{2}$$

$$x = \frac{10}{2}$$

$$x = 5$$

$$x + \frac{5}{2} = -\frac{15}{2}$$

$$-\frac{5}{2} \quad -\frac{5}{2}$$

$$x = -\frac{20}{2}$$

$$x = -10$$

3 EXAMPLE Solve $x^2 + 10x - 16 = 0$ by completing the square. Round to the nearest hundredth. ⁺¹⁶ ⁺¹⁶

$$x^2 + 10x = 16$$

$$+ \left(\frac{10}{2}\right)^2 \quad + \left(\frac{10}{2}\right)^2$$

$$x^2 + 10x + 25 = 16 + 25 \quad |$$

$$\sqrt{(x+5)^2} = \sqrt{41} \quad \text{solve}$$

$$x+5 = \pm 6.4$$

$$x+5 = 6.4$$

$$\quad \quad \quad -5$$

$$x = 1.4$$

$$x+5 = -6.4$$

$$\quad \quad \quad -5$$

$$x = -11.4$$

Homework: pg. 582 #2 - 24even