

Solve by Completing the Square.

$$x^2 - 3x - 7 = 0$$

$$\begin{aligned} x^2 - 3x + \frac{9}{4} &= 7 + \frac{9}{4} \\ \sqrt{\left(x - \frac{3}{2}\right)^2} &= \sqrt{\frac{37}{4}} \\ x - \frac{3}{2} &= \pm \frac{\sqrt{37}}{2} \\ +\frac{3}{2} \quad +\frac{3}{2} & \quad \quad \quad = \frac{3 \pm \sqrt{37}}{2} \end{aligned}$$

Solve by Completing the Square.

$$2x^2 + 12x + 80 = 0$$

$$\begin{aligned} \frac{2x^2 + 12x}{2} &= \frac{-80}{2} \\ x^2 + 6x + 9 &= -40 + 9 \\ \sqrt{(x+3)^2} &= \sqrt{-31} \\ x+3 &= \pm i\sqrt{31} \\ -3 \quad -3 & \quad \quad \quad = -3 \pm i\sqrt{31} \end{aligned}$$

Solve by Completing the Square.

$$\begin{aligned} \frac{2x^2 - 18x}{2} &= \frac{19}{2} \\ x^2 - 9x + \frac{81}{4} &= \frac{19}{2} \cdot \frac{2}{2} + \frac{81}{4} = \frac{119}{4} \\ \sqrt{\left(x - \frac{9}{2}\right)^2} &= \sqrt{\frac{119}{4}} \\ x - \frac{9}{2} &= \frac{\pm \sqrt{119}}{2} \Rightarrow \boxed{\frac{9 \pm \sqrt{119}}{2}} \end{aligned}$$

Solve by Completing the Square.

$$2x^2 + 3x + 11 = 0$$

$$\begin{aligned} \frac{2x^2 + 3x}{2} &= \frac{-11}{2} \\ x^2 + \frac{3}{2}x + \frac{9}{16} &= -\frac{11}{2} \cdot \frac{8}{8} + \frac{9}{16} \\ \sqrt{\left(x + \frac{3}{4}\right)^2} &= \sqrt{\frac{-79}{16}} \\ x + \frac{3}{4} &= \frac{\pm \sqrt{79}}{4} \Rightarrow \boxed{\frac{-3 \pm \sqrt{79}}{4}} \end{aligned}$$

Solve by Completing the Square.

$$5x^2 + 7x - 2 = 0$$

$$\begin{aligned} \frac{5x^2 + 7x}{5} &= \frac{2}{5} \\ x^2 + \frac{7}{5}x + \frac{49}{100} &= \frac{2}{5} + \frac{49}{100} \\ \sqrt{\left(x + \frac{7}{10}\right)^2} &= \sqrt{\frac{89}{100}} \\ x + \frac{7}{10} &= \pm \frac{\sqrt{89}}{10} \\ -\frac{7}{10} \quad -\frac{7}{10} &\Rightarrow \boxed{\frac{-7 \pm \sqrt{89}}{10}} \end{aligned}$$

Solve by Completing the Square.

$$ax^2 + bx + c = 0$$

$$\begin{aligned} \frac{ax^2 + bx}{a} &= \frac{-c}{a} \\ x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} &= \frac{-c}{a} \cdot \frac{4a}{4a} + \frac{b^2}{4a^2} \\ \sqrt{\left(x + \frac{b}{2a}\right)^2} &= \sqrt{\frac{b^2 - 4ac}{4a^2}} \\ x + \frac{b}{2a} &= \frac{\pm \sqrt{b^2 - 4ac}}{2a} \\ -\frac{b}{2a} \quad -\frac{b}{2a} &\Rightarrow \boxed{\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}} \end{aligned}$$

when you complete the square with $ax^2 + bx + c$ you get the Quadratic Formula!

Rewrite into Vertex Form:

$$y = x^2 + 20x - 3$$

$$\text{LOS } x = \frac{-20}{2} = -10$$

$$\text{Vertex } (-10, -103)$$

$$y = (x+10)^2 - 103$$

Rewrite into Vertex Form:

Using completing the square

$$y = x^2 + 20x - 3$$

$$y + 3 + 100 = x^2 + 20x + 100$$

$$y + 103 = (x+10)^2 - 103 \rightarrow y = (x+10)^2 - 103$$

Hwk #21 Sec 5-7

Page 285

Problems 23-26, 28-30