

Completing the Square

Complete the square to write the quadratic in vertex form  
Use the vertex form to solve the quadratic and find the x-intercepts

$$y = x^2 + 10x + 5$$

$$y - 5 = x^2 + 10x$$

$$y - 5 + 25 = x^2 + 10x + 25$$

$$y + 20 = (x + 5)^2$$

$$y = (x + 5)^2 - 20$$

$$20 = (x + 5)^2$$

$$\pm\sqrt{20} = x + 5$$

$$x = -5 \pm \sqrt{20}$$

$$\boxed{x = -5 \pm 2\sqrt{5}}$$

$$y = x^2 - 4x - 40$$

$$y + 40 = x^2 - 4x$$

$$y + 40 + 4 = x^2 - 4x + 4$$

$$y + 44 = (x - 2)^2$$

$$y = (x - 2)^2 - 44$$

$$44 = (x - 2)^2$$

$$\pm\sqrt{44} = x - 2$$

$$\boxed{x = 2 \pm 2\sqrt{11}}$$

$$y = x^2 + 6x - 39$$

$$y + 39 = x^2 + 6x$$

$$y + 39 + 9 = x^2 + 6x + 9$$

$$y + 48 = (x + 3)^2$$

$$y = (x + 3)^2 - 48$$

$$48 = (x + 3)^2$$

$$\pm\sqrt{48} = x + 3$$

$$\boxed{-3 \pm 4\sqrt{3} = x}$$

$$y = x^2 - 8x - 2$$

$$y + 2 = x^2 - 8x$$

$$y + 2 + 16 = x^2 - 8x + 16$$

$$y + 18 = (x - 4)^2$$

$$y = (x - 4)^2 - 18$$

$$18 = (x - 4)^2$$

$$\pm\sqrt{18} = x - 4$$

$$\boxed{x = 4 \pm 3\sqrt{2}}$$

## Completing the Square

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$$y = x^2 + 2x - 23$$

$$y + 23 = x^2 + 2x$$

$$y + 23 + 1 = x^2 + 2x + 1$$

$$y + 24 = (x + 1)^2$$

$$24 = (x + 1)^2$$

$$\pm\sqrt{24} = x + 1$$

$$\boxed{x = -1 \pm 2\sqrt{6}}$$

$$y = x^2 - 10x + 18$$

$$y - 18 = x^2 - 10x$$

$$y + 7 = (x - 5)^2$$

$$7 = (x - 5)^2$$

$$\boxed{5 \pm \sqrt{7} = x}$$

$$y = x^2 - 12x - 28$$

$$y + 28 = x^2 - 12x$$

$$y + 28 + 36 = x^2 - 12x + 36$$

$$y + 64 = (x - 6)^2$$

$$64 = (x - 6)^2$$

$$x = 6 \pm 8$$

$$\boxed{\begin{array}{l} x = 14 \\ x = -2 \end{array}}$$

$$y = x^2 + 12x - 144$$

$$y + 144 = x^2 + 12x$$

$$144 + 36 = x^2 + 12x + 36$$

$$180 = (x + 6)^2$$

$$\boxed{-6 \pm 6\sqrt{5} = x}$$