2.6 The Quadratic Formula

Solve

$$x^2 + 8x = 2$$

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

$\sqrt{(x+4)^2} = \sqrt{18}$

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

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

$-4 \pm 3\sqrt{2}$

$\sqrt{18} = \sqrt{9}\cdot\sqrt{2}$

$3\sqrt{2}$

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$y = ax^2+bx+c$

$0 = ax^2+bx+c$

$-c \qquad -c$

$-\frac{c}{a} + \left(\frac{b}{2a}\right)^2 = x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2$

$\pm\sqrt{-\frac{c}{a}+\frac{b^2}{4a^2}} = \sqrt{\left(x+\frac{b}{2a}\right)^2}$

$\pm\sqrt{-\frac{c(4a)}{a(4a)}+\frac{b^2}{4a^2}} = x+\frac{b}{2a}$

$\pm\sqrt{\frac{-4ac}{4a^2}+\frac{b^2}{4a^2}} = x+\frac{b}{2a}$

$\pm\sqrt{\frac{b^2-4ac}{4a^2}} = x+\frac{b}{2a}$

$\pm\frac{\sqrt{b^2-4ac}}{2a} = x+\frac{b}{2a}$

$$x = \frac{-b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$$

→ Discriminate

Discriminate

Solve

$x^2 + 3x - 4 = 0$

Factor

$(x+4)(x-1) = 0$

$x+4=0 \quad x-1=0$

$x=-4 \quad x=1$

Complete the square

$x^2 + 3x - 4 = 0$

$x^2+3x+\frac{9}{4} = 4+\frac{9}{4}$

$\sqrt{(x+\frac{3}{2})^2} = \sqrt{\frac{25}{4}}$

$x+\frac{3}{2} = \pm\frac{5}{2}$

$x = -\frac{3}{2} \pm \frac{5}{2}$

$-\frac{3}{2}+\frac{5}{2} \qquad -\frac{3}{2}-\frac{5}{2}$

$1 \qquad -4$

$4 = \frac{16}{4}$

Quadratic Formula

$x^2 + 3x - 4 = 0$

$a=1 \quad b=3 \quad c=-4$

$\frac{-b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$

$\frac{-3}{2(1)} \pm \frac{\sqrt{(3)^2-4(1)(-4)}}{2(1)}$

$-\frac{3}{2} \pm \frac{\sqrt{9-(-16)}}{2}$

$-\frac{3}{2} \pm \frac{\sqrt{25}}{2}$

$-\frac{3}{2} \pm \frac{5}{2}$

$-\frac{3}{2}+\frac{5}{2} \qquad -\frac{3}{2}-\frac{5}{2}$

$1 \qquad -4$

Solve

$3x^2 - 4x - 9 = 0$

$a=3 \quad b=-4 \quad c=-9$

$$-\frac{b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$$

$$\frac{4}{2(3)} \pm \frac{\sqrt{(-4)^2-4(3)(-9)}}{2(3)}$$

$$\frac{4}{6} \pm \frac{\sqrt{16-(-108)}}{6}$$

$$\frac{2}{3} \pm \frac{\sqrt{124}}{6}$$

$$\frac{2}{3} \pm \frac{\sqrt{4}\cdot\sqrt{31}}{6}$$

$$\frac{2}{3} \pm \frac{2\sqrt{31}}{6} = \frac{2}{3} \pm \frac{\sqrt{31}}{3}$$

$$\frac{2}{3} \pm \frac{1}{3}\sqrt{31}$$

Solve → find x-intercepts

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

$a=3 \quad b=-2 \quad c=7$

$$\frac{-b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$$

16, 17
20, 21

2.6

$$\frac{2}{2(3)} \pm \frac{\sqrt{(-2)^2-4(3)(7)}}{2(3)}$$

$$\frac{2}{6} \pm \frac{\sqrt{4-84}}{6}$$

$$\frac{1}{3} \pm \frac{\sqrt{-80}}{6}$$

$\sqrt{-80} = \sqrt{16} \cdot \sqrt{5} \cdot \sqrt{-1}$

$= 4i\sqrt{5}$

$$\frac{1}{3} \pm \frac{4i\sqrt{5}}{6}$$

$$\frac{1}{3} \pm \frac{2i\sqrt{5}}{3}$$