

B.3 Solving Equations Algebraically and Graphically

Ex. ① Solve: $x^2 + 3x - 7 = 0$ A Quadratic Equation

a) Algebraically

(By the Quadratic Formula)

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

$$= \frac{-3 \pm \sqrt{9 - 4(-7)}}{2}$$

$$= \frac{-3 \pm \sqrt{37}}{2}$$

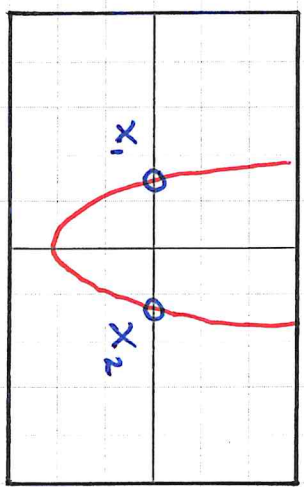
$$x_1 = \frac{-3 + \sqrt{37}}{2}$$

$$x_2 = \frac{-3 - \sqrt{37}}{2}$$

b) Graphically

(By the Graphing Calculator)

Graph: $y_1 = x^2 + 3x - 7$



Standard Window

2nd [CALC] → [ZERO]

Left Bound: Close but smaller than

Right Bound: Close but larger than

$$x_1 = -4.541$$

$$x_2 = 1.541$$

Ex. ② Solve: $4x^3 + 12x^2 - 8x - 24 = 0$

Zero Form

y_1

A Cubic Equation

a) By factoring:

$$4(x^3 + 3x^2 - 2x - 6) = 0$$

$$x^3 + 3x^2 - (2x + 6) = 0$$

$$(x^3 + 3x^2) - (2x + 6) = 0$$

$$x^2(x + 3) - 2(x + 3) = 0$$

$$(x + 3)(x^2 - 2) = 0$$

$$x + 3 = 0 \text{ or } x^2 - 2 = 0$$

$$x = -3$$

$$x^2 = 2$$

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

Solutions:

$$\boxed{-3, -\sqrt{2}, \sqrt{2}}$$

b) By graphing:

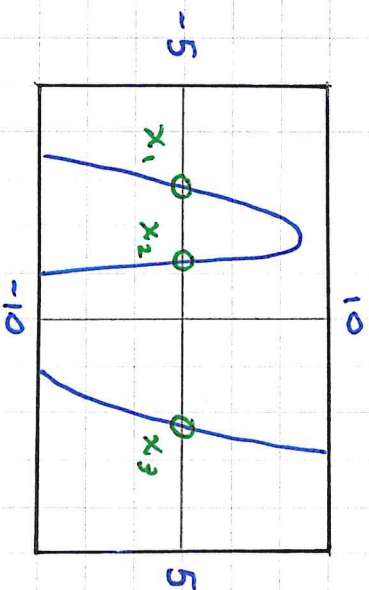
Graph:

$$y_1 = 4x^3 + 12x^2 - 8x - 24$$

Solutions: $x_1 = -3$

$$x_2 = -1.414$$

$$x_3 = 1.414$$



Window: $[-5, 5] \times [-10, 10]$

Ex. ③

Solve:

$$\frac{1}{x-3} + \frac{1}{x+3} = \frac{10}{x^2-9}$$

$\xrightarrow{\text{LCD}} (x+3)(x-3)$

A Rational Equation

a) By algebra:

$$\text{LCD} = (x-3)(x+3)$$

Clear fractions:

$$(x-3)(x+3) \left[\frac{1}{x-3} + \frac{1}{x+3} \right] = (x-3)(x+3) \left[\frac{10}{x^2-9} \right]$$

$$x+3 + x-3 = 10$$

$$2x = 10$$

$$\boxed{x = 5}$$

b) By graphing:

Zero Form:

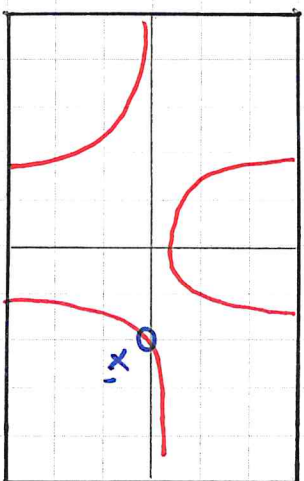
$$\frac{1}{x-3} + \frac{1}{x+3} - \frac{10}{x^2-9} = 0$$

$$\text{Graph: } y_1 = \frac{1}{x-3} + \frac{1}{x+3} - \frac{10}{x^2-9}$$

$$y_1 = 1/(x-3) + 1/(x+3) - 10/(x^2-9)$$

Solution:

$$\boxed{x_1 = 5}$$



Standard Window