

الف) $x^2 - 5x - 4 = 0$ $x^2 - 5x - 19 = 0$ $(x-4)(x+4) = 0$
 $\downarrow \quad \downarrow$
 $4 \quad -4 \xrightarrow{\div 4} \frac{4}{4} = 1, \quad \frac{-4}{4} = -1$

ب) $x^2 - 1x - 9 = 0$ $(x-9)(x+1) = 0$
 $\downarrow \quad \downarrow$
 $9 \quad -1 \xrightarrow{\div 9} \frac{9}{9} = 1, \quad \frac{-1}{9} = -\frac{1}{9}$

ج) $x^2 - 4x - 12 = 0$ $(x-4)(x+3) = 0$
 $\downarrow \quad \downarrow$
 $4 \quad -3 \xrightarrow{\div 4} \frac{4}{4} = 1, \quad \frac{-3}{4} = -\frac{3}{4}$

د) $x^2 - 2x - 12 = 0$ $(x-1)(x+3) = 0$
 $\downarrow \quad \downarrow$
 $1 \quad -3 \xrightarrow{\div 1} \frac{1}{1} = 1, \quad \frac{-3}{1} = -3$

الف) $x^2 - 2x - 12 = 0$ $(x+2)(x-6) = 0$ $x = -2, 6$
 $\downarrow \quad \downarrow$
 $-2 \quad -6 \xrightarrow{\div -2} \frac{-2}{-2} = 1, \quad \frac{-6}{-2} = 3$

ب) $x^2 + 2x + 4 = 0$ $(x+2)(x+3) = 0$ $x = -2, -3$
 $\downarrow \quad \downarrow$
 $2 \quad 3 \xrightarrow{\div 2} \frac{2}{2} = 1, \quad \frac{3}{2} = 1.5$

ج) $x^2 + 2x + 1 = 0$ $\Delta = b^2 - 4ac = 4 - 4(1)(1) = 0$ $x = -1$
 $\Delta = 4 - 4 = 0$

د) $3x^2 + 3x - 2 = 0$ $\Delta = 9 - 4(-2)(3) = 9 + 24 = 33$ $x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-3 \pm \sqrt{33}}{6}$

$A \times B - B^T = A \times B - B \times B = \{(1, 2), (1, 3)\}$

$A \times B = \{(1, 2), (1, 3), (2, 4), (2, 3), (3, 4), (4, 3)\}$

$B \times B = \{(2, 4), (3, 4), (4, 3), (4, 4)\}$

$f(x) = \{(1, m), (2, 1), (-3, m), (-2, m), (1, m+2), (m, 4)\}$
 $m^2 = m + 2 \rightarrow m^2 - m - 2 = 0 \rightarrow (m-2)(m+1) = 0$
 $m = 2, -1$

$g(x) = \{(1, m^2), (2, 1), (m, 4), (1, m+2), (-2, m), (-1, 3)\}$
 $m^2 = m + 2 \rightarrow m^2 - m - 2 = 0 \rightarrow (m-2)(m+1) = 0$
 $m = 2, -1$

$a^2 = 3a - 2$
 $a^2 - 3a + 2 = 0$ $(a-2)(a-1) = 0$
 $a = 2, 1$

$a = 2 \rightarrow \{(1, 4), (1, 4), (4, 1)\}$ $a \neq 2$
 $a = 1 \rightarrow \{(1, 1), (1, 1), (1, 2)\}$ $a = 1$

$$x=1 \quad x^2-1 = ax+b$$

$$0 = a+b$$

$$x=2 \quad ax+b = x^3$$

$$2a+b = 1$$

$$x^2 \begin{cases} a+b=0 \\ 2a+b=1 \end{cases}$$

$$-b=1 \rightarrow b=-1, a=1$$

$$ab = (-1)(1) = -1 \quad \text{✓} \quad \textcircled{2}$$

$$x=k \quad 2x-3 = 4-3x$$

$$2k-3 = 4-3k$$

$$5k = 7 \rightarrow k = \frac{7}{5} \quad \text{✓} \quad \textcircled{2}$$

الف) $x=1 \rightarrow y^3-4y=0$ تابع سیم

$$y(y^2-4)=0 \quad y=0 \quad \vee \quad y=\sqrt{4} \quad \vee \quad y=-\sqrt{4} \quad \text{✓}$$

1,5

ب) $x=0 \rightarrow |y|=3 \quad y=\pm 3$ تابع سیم

ج) $y = \pm \sqrt{1-\cos \theta}$ تابع سیم

د) $x=-2 \rightarrow y^2=3 \quad y=\pm\sqrt{3}$ تابع سیم

$$y^2 + n^2 + 2n + 1 \xrightarrow{n \rightarrow -2} y^2 + 4 - 2 + 1 = 0 \rightarrow y^2 = -1 \quad x$$

الف) $\sqrt[3]{y} = -x^2 + 2x - 2$

$$\sqrt[3]{y_1} = -x_1^2 + 2x_1 - 2 \quad \left\{ \begin{array}{l} x_1 = x_2 \\ \sqrt[3]{y_1} = \sqrt[3]{y_2} \end{array} \right.$$

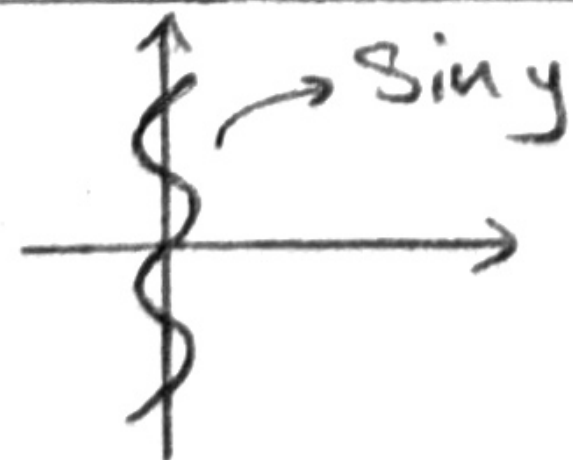
$$\sqrt[3]{y_2} = -x_2^2 + 2x_2 - 2 \quad \left\{ \begin{array}{l} x_1 = x_2 \\ y_1 = y_2 \end{array} \right. \quad \checkmark$$

1,25

ب) $y^3 + 2y = \omega x$ باید متریف ریاضی را کامل بنویس!

$$\left. \begin{array}{l} y_1^3 + 2y_1 = \omega x_1 \\ y_2^3 + 2y_2 = \omega x_2 \end{array} \right\} \xrightarrow{x_1 = x_2} y_1^3 + 2y_1 = y_2^3 + 2y_2 \quad \checkmark$$

الف) $x \sin y$



تابع سیم } برای هر x عددی y دارد

ب) $t = \sqrt{\frac{x}{y}} \rightarrow t + \frac{1}{t} = 2$

$$t + \frac{1}{t} - 2 = 0$$

$$(t - \frac{1}{t})^2 = 0 \rightarrow t - \frac{1}{t} = 0 \rightarrow t = 1 \rightarrow \frac{x}{y} = 1 \rightarrow x = y \quad \checkmark$$

$x \neq 0$

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$$8 - د) \quad y^2 + x^2 + 2x + 1 = 0 \quad \leadsto \quad y^2 + (x+1)^2 = 0$$

همو دو مقدار نامعتبر صفر است پس هر دو صفر هستند یعنی باید نقطه‌ای $(-1, 0)$ رو به دور هستیم که تا بررسی است!

$$9 - ب) \quad y''' + 2y = \sin x$$

$$\int y_1''' + 2y_1 = \sin x_1$$

$$x_1 < x_2 \rightarrow$$

$$y_1''' + 2y_1 = y_2''' + 2y_2$$

$$\int y_2''' + 2y_2 = \sin x_2$$

$$y_1''' - y_2''' + 2(y_1 - y_2) = 0 \quad \leadsto \quad (y_1 - y_2)' (y_1'' + y_1 y_2' + y_2'' + 2) = 0$$

$$I \leadsto y_1 - y_2 = 0 \quad \leadsto \quad y_1 = y_2 \quad \text{این دو یکسان هستند پس صرف نظر}$$

$$II \leadsto y_1'' + y_1 y_2' + y_2'' + 2 = 0 \quad \leadsto \quad y_1 = \frac{-y_2' \pm \sqrt{y_2'^2 - 4(y_2'' + 2)}}{2} \quad \times$$

$$\leadsto y_1 = y_2 \quad \text{تا بررسی است!}$$