

الف) $2x^2 - 5x - 4 = 0$ $x^2 - 5x - 4 = 0$ $(x-6)(x+4) = 0$ $\rightarrow$ ریشه ها $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$

ب) $3x^2 - 11x - 4 = 0$ $x^2 - 11x - 4 = 0$ $(x+1)(x-9) = 0$ $\rightarrow$ ریشه ها $\begin{pmatrix} -1 \\ 9 \end{pmatrix}$

ج) $4x^2 - 4x - 1 = 0$ $x^2 - 1x - 1 = 0$ $(x-4)(x+2) = 0$ $\rightarrow$ ریشه ها $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$

د) $2x^2 - 5x - 12 = 0$ $x^2 - 5x - 24 = 0$ $(x-8)(x+3) = 0$ $\rightarrow$ ریشه ها $\begin{pmatrix} 8 \\ -3 \end{pmatrix}$

الف) $x^2 - 5x - 14 = 0$ $(x-7)(x+2) = 0$ $\rightarrow$ ریشه ها $\begin{pmatrix} 7 \\ -2 \end{pmatrix}$

ب) $2x^2 + 5x + 3 = 0$ $\frac{-5 \pm \sqrt{25 - 4 \times 2 \times 3}}{2 \times 2} \rightarrow \frac{-5 \pm 1}{4} = \frac{-4}{4} = -1$
 $\frac{-5 - 1}{4} = \frac{-6}{4} = \frac{-3}{2}$

ج) $x^2 + 2x + 3 = 0$ $\frac{-2 \pm \sqrt{4 - 4 \times 1 \times 3}}{2} \rightarrow \Delta < 0$ ریشه ها ندارد

د) $3x^2 + 3x - 2 = 0$ $\frac{-3 \pm \sqrt{9 - 4 \times 3 \times (-2)}}{6} \rightarrow \frac{-3 \pm \sqrt{33}}{6} \rightarrow \frac{-1}{2} \pm \frac{\sqrt{33}}{6}$

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

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

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

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

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

$m^2 = m + 2$ $m^2 - m - 2 = 0$ $a+c=b$ $\rightarrow$ قابل قبول نیست $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$ $\rightarrow$ $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$ و $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$ پس تابع نیست

$\Rightarrow \boxed{m=2}$

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

$m^2 = m + 2$ $m^2 - m - 2 = 0$ $\rightarrow$ قابل قبول نیست $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$ $\rightarrow$ $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$ و $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$ پس تابع نیست

$\Rightarrow \boxed{m=2}$

$f(x) = \{(1, a^2), (1, 3a-2), (a^2, 3a+2)\}$

$3a-2 = a^2$ $a^2 - 3a + 2 = 0$ $(a-1)(a-2) = 0$ $\rightarrow$ قابل قبول نیست $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$ $\rightarrow$ $\{(1, 4), (1, 4), (4, 8)\}$ ✓

$\Rightarrow \boxed{a=2}$

تابع نیست $\{ (1, 1), (1, 1), (1, 1) \}$

$$f(x) \begin{cases} x^2-1 & x \leq 1 \\ ax+b & 1 \leq x \leq 2 \\ x^2 & x \geq 2 \end{cases} \quad a \times b = ? \quad 1 \times -1 = \int_{-1}^1 f(x) dx$$

$$\begin{aligned} x=1 \quad \begin{cases} x^2 = ax+b \\ 1 = 2a+b \end{cases} \quad \begin{cases} x=2 \quad \begin{cases} x^2-1 = ax+b \\ 1-1 = a+b \\ a+b=0 \end{cases} \end{cases} \end{aligned} \rightarrow \begin{aligned} 2a+b &= 1 \\ a+b &= 0 \\ \hline a &= 1 \rightarrow b = -1 \end{aligned}$$

$$f(x) \begin{cases} 2x-3 & x \geq k \\ 4-3x & x \leq k \end{cases} \quad \begin{aligned} 2k-3 &= f-3k \\ 4-3k &= f-3k \\ \Delta k &= V \end{aligned} \quad \left(k = \frac{V}{\Delta} \right)$$

الف) $y^3 - y = x^2 - 4x + 3$ تابع نیست

ب) $|x| + |y| = 3$ $x=1 \rightarrow 1 + |y| = 3 \rightarrow |y| = 2$ $y = \pm 2$ تابع نیست

ج) $|y| = \sqrt{1 - \cos x}$ $x=0 \rightarrow y=0$ $\sqrt{1-0} = 1$ $|y| = 1$ $y = \pm 1$ تابع نیست

د) $y^2 + x^2 + 2x + 1 = 0$ $y^2 + (x+1)^2 = 0 \rightarrow y=0, x=-1$ تابع است

الف) $\sqrt[3]{y} + x^2 = 2x-2$ $\begin{cases} \sqrt[3]{y_1} = 2x_1-2-x_1^2 \\ \sqrt[3]{y_2} = 2x_2-2-x_2^2 \end{cases} \xrightarrow{x_1=x_2} \begin{cases} \sqrt[3]{y_1} = \sqrt[3]{y_2} \\ y_1 = y_2 \end{cases}$ تابع

ب) $y^3 + 2y = 5x$ $\begin{cases} y_1^3 + 2y_1 = 5x \\ y_2^3 + 2y_2 = 5x \end{cases} \rightarrow y_1^3 + 2y_1 = y_2^3 + 2y_2$
 $y_1^3 - y_2^3 + 2y_1 - 2y_2 = 0$
 $(y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2 + 2y_1 + 2y_2) = 0$
 $(y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2 + 2y_1 + 2y_2) = 0$
 $y_1 = y_2$ تابع است

الف) $x \sin y = y \sin x$ $x = \pi \leq 10$ $\pi \sin y = 0 \rightarrow y = n\pi$
 برای y مقادیر مختلفه وجود دارد
 $y=0 \leq y=\pi \leq y=2\pi \dots$

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

$\frac{x}{y} + \frac{y}{x} + 2\left(\frac{x}{y} \times \frac{y}{x}\right) = 4$

$\frac{(x-y)^2}{xy} = 0$
 $x=y$ تابع $(x, y \neq 0)$

$(x-y)^2 = 0$
 $x=y$ تابع $(x, y \neq 0)$