

$$A = \{1, 2, 3\} \quad B = \{2, 3\}$$

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

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

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

1

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

(الف)

$$m^2 = m+2 \rightarrow m^2 - m - 2 = 0 \rightarrow m = 2 \text{ غیر قابل قبول } \boxed{m = -1} \checkmark$$

2

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

(ب)

$$m^2 = m+2 \rightarrow m^2 - m - 2 = 0 \rightarrow m = -1 \text{ قابل قبول } \boxed{m = 2} \checkmark$$

$$f(x) = \begin{cases} x^2 - 1 & ; x \leq 1 \\ ax + b & ; 1 \leq x \leq 2 \\ x^2 & ; x \geq 2 \end{cases}$$

$$x = 1 \rightarrow 1 - 1 = a + b \rightarrow a + b = 0$$

$$x = 2 \rightarrow 2a + b = 1$$

$$\begin{cases} -a - b = 0 \\ 2a + b = 1 \end{cases} \rightarrow \begin{matrix} -a - b = 0 \\ 2a + b = 1 \\ \hline a = 1 \end{matrix}$$

$$a + b = 0 \xrightarrow{a=1} 1 + b = 0 \rightarrow \boxed{b = -1}$$

$$\boxed{a \times b = 1 \times (-1) = -1}$$

3

$$f(x) = \begin{cases} 2x - 3 & ; x \geq K \\ 4 - 3x & ; x \leq K \end{cases}$$

$$2x - 3 = 4 - 3x \rightarrow 5x = 7 \rightarrow \boxed{x = \frac{7}{5} = K}$$

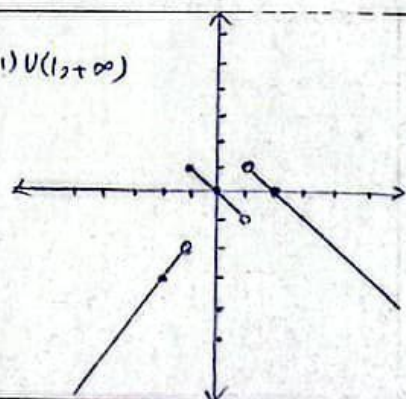
4

$$f(x) = \begin{cases} -x + 2 & ; x > 1 \\ -x & ; -1 \leq x < 1 \\ x - 1 & ; x < -1 \end{cases}$$

$$D = \mathbb{R} - \{1\} = (-\infty, 1) \cup (1, +\infty)$$

$$R = [1, -\infty)$$

$$\begin{aligned} -x + 2 = y \xrightarrow{x=1} (1, 1) & \quad -x + 2 = y \xrightarrow{x=2} (2, 0) \\ -x = y \xrightarrow{x=1} (1, -1) & \quad -x = y \xrightarrow{x=-1} (-1, 1) \\ x - 1 = y \xrightarrow{x=-1} (-1, -2) & \quad x - 1 = y \xrightarrow{x=-2} (-2, -3) \end{aligned}$$



الف) $xy^3 + x^2 + 1 = 0 \Rightarrow \begin{cases} -x^2 = xy_1^3 + 1 \\ -x^2 = xy_r^3 + 1 \end{cases} \Rightarrow xy_1^3 + 1 = xy_r^3 + 1 \Rightarrow y_1^3 = y_r^3 \Rightarrow y_1 = y_r$
 تابع است. ۶

ب) $x^2 + 4y^2 - 2x - 12y + 1 = 0 \Rightarrow (x^2 - 2x + 1) + 4(y^2 - 3y) + 1 = 0 \Rightarrow (x-1)^2 - 1 + 4(y - \frac{3}{2})^2 - 9 + 1 = 0$
 $\Rightarrow (x-1)^2 + 4(y - \frac{3}{2})^2 = 9$ $x-1=0 \Rightarrow x=1$ $y - \frac{3}{2} = 0 \Rightarrow y = \frac{3}{2}$ $(1, \frac{3}{2})$ تابع است.

الف) $x \sin y = y \sin x \xrightarrow{x=0} y \in \mathbb{R}$ تابع است.

ب) $\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}} = 2 \Rightarrow (\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}})^2 = 4 \Rightarrow \frac{x}{y} + 2\sqrt{\frac{x}{y} \times \frac{y}{x}} + \frac{y}{x} = 4$

$\Rightarrow \frac{x}{y} + 2 + \frac{y}{x} = 4 \Rightarrow \frac{x}{y} + \frac{y}{x} = 2 \Rightarrow \frac{x^2 + y^2}{xy} = 2 \Rightarrow x^2 + y^2 = 2xy \Rightarrow x^2 - 2xy + y^2 = 0$
 $\Rightarrow (x-y)^2 = 0 \Rightarrow x=y$ تابع است.

الف) $\frac{x-1}{x-3} \geq 0$ $\frac{x}{+} \frac{1}{-} \frac{3}{+} \rightarrow (1) = (-\infty, 1] \cup (3, +\infty)$

$\frac{2-x}{x} \geq 0$ $\frac{x}{-} \frac{0}{+} \frac{2}{+} \rightarrow (2) = (0, 2]$ $(1) \cap (2) = (0, 1]$ مثبت

ب) $x \geq 0$ $y-1 \geq 0 \Rightarrow y \geq 1$ $\sqrt{x} + \sqrt{y-1} = \sqrt{3} \Rightarrow \sqrt{y-1} = \sqrt{3} - \sqrt{x}$
 $\Rightarrow \sqrt{3} \geq \sqrt{x} \Rightarrow x \leq 3$ $\Rightarrow 0 \leq x \leq 3$ $\therefore D = [0, 3]$

الف) $x^2 - 7x + 6 \geq 0 \Rightarrow (x-1)(x-6) \geq 0$ $\frac{x}{+} \frac{1}{-} \frac{6}{+} \rightarrow (1) = (-\infty, 1] \cup (6, +\infty)$

$x^2 - 10x + 14 > 0 \Rightarrow (x-2)(x-7) > 0$ $\frac{x}{+} \frac{2}{-} \frac{7}{+} \rightarrow (2) = (-\infty, 2) \cup (7, +\infty)$

$(1) \cap (2) = (-\infty, 1] \cup (7, +\infty) = D$

ب) $\frac{(x-1)(x-6)}{(x-2)(x-7)} \geq 0$ $\frac{x}{+} \frac{1}{-} \frac{2}{-} \frac{6}{+} \frac{7}{+} \rightarrow \therefore D = (-\infty, 1] \cup (2, 6] \cup (7, +\infty)$

الف) $2x^2 - 5x + 3 \geq 0 \Rightarrow (x-1)(2x-3) \geq 0$ $\frac{x}{+} \frac{1}{-} \frac{3}{+} \rightarrow (1) = (-\infty, 1] \cup [\frac{3}{2}, +\infty)$

$3x^2 - 7x + 4 > 0 \Rightarrow (x-1)(3x-4) > 0$ $\frac{x}{+} \frac{1}{-} \frac{4}{+} \rightarrow (2) = (-\infty, 1) \cup (\frac{4}{3}, +\infty)$

$(1) \cap (2) = (-\infty, 1) \cup [\frac{4}{3}, +\infty)$

ب) $\frac{2x^2 - 5x + 3}{3x^2 - 7x + 4} \geq 0 \Rightarrow \frac{(x-1)(2x-3)}{(x-1)(3x-4)} \geq 0$ $\frac{x}{+} \frac{1}{-} \frac{3}{+} \frac{4}{-} \rightarrow \therefore D = (-\infty, 1) \cup (1, \frac{4}{3}) \cup [\frac{3}{2}, +\infty)$

$\therefore D = (-\infty, 1) \cup (1, \frac{4}{3}) \cup [\frac{3}{2}, +\infty)$