

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

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

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

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

$$\{(n, m^2) \in f(n), (n, m+1) \in f(n)\} \Rightarrow m+1 = m^2 \Rightarrow m < -1$$

$$m=2 \rightarrow (m, n) = (2, 4), (2, -1) \rightarrow f(n) \text{ شامل } m=-1 \rightarrow f(n) \text{ شامل } m=2$$

$$g(n) = \{(n, m^2), (n, 1), (m, n), (n, m+1), (-n, m), (-n, m+1)\}$$

$$(n, m^2), (n, m+1) \in f(n) \Rightarrow m < -1 \quad m=-1 \rightarrow (-1, 4), (-1, 3) \in f(n) \Rightarrow f(n) \text{ شامل } m=2$$

$$m=2 \rightarrow g(n) \text{ شامل } (2, 1), (2, 4)$$

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

$$\begin{aligned} n=1 & \Rightarrow n^2 - 1 = 0 \\ n=1 & \Rightarrow a + b \\ n=2 & \Rightarrow 2a + b \\ n=2 & = n^2 = 4 \end{aligned}$$

$$\begin{aligned} a + b &= 0 \\ a &= -b \\ 2a + b &= 4 \\ a &= 1 \\ b &= -1 \end{aligned}$$

$$\Rightarrow a \times b = -4$$

$$n=k \Rightarrow 2k-3 = 5-3k \Rightarrow 5k = 8 \Rightarrow k = \frac{8}{5}$$

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

$$D = \mathbb{R} - \{1\}$$

$$R = (-\infty, 1]$$

الف) $xy^3 = -(x^2+1) \Rightarrow -(x^2+1) = xy_1^3 \Rightarrow y_1^3 = y_2^3 \Rightarrow y_1 = y_2$
 $\checkmark \quad -(x^2+1) = xy_2^3 \Rightarrow y_2 = y_1 \Rightarrow y_1 = y_2$

ب) $-(x^2 - 2x + 1) + (xy^2 - 12y + 9) = 0 \Rightarrow (x^2 - 2x + 1) = -(xy^2 - 12y + 9)$
 $\Rightarrow (x-1)^2 = -(y-3)^2$ دو عبارت همواره منفی و همواره مثبت با هم برابرند پس حاصل این دو صفر است
 $\Rightarrow x=1, y=3 \Rightarrow f(x) = \{(1, 3)\}$ تابع یک نقطه است 1,5

الف) $y \sin x = x \sin y \mid x=y=0 \Rightarrow y \in \mathbb{R} \rightarrow$ تابع زوج است ✓
 ب) $\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}} = 2 \Rightarrow \frac{x}{y} + \frac{y}{x} + 2 = 4 \Rightarrow \frac{x}{y} + \frac{y}{x} = 2$
 $\Rightarrow x^2 + y^2 - 2xy = 0 \Rightarrow (x-y)^2 = 0 \Rightarrow x-y=0 \Rightarrow x=y$
 $\boxed{x=y, x \neq 0} \Rightarrow \frac{e^x}{x}$ ✓ 2

الف) $y = \sqrt{\frac{x-1}{x-2}} + \sqrt{\frac{x-2}{x-1}}$
 $(\mathbb{R} - (1, 2)) \cap (0, 1] = (0, 1] \Rightarrow D_f = [0, 1] \quad D_f = (0, 1]$
 ب) $\sqrt{x} + \sqrt{y-1} = \sqrt{3} \Rightarrow \sqrt{x} - \sqrt{3} = -\sqrt{y-1} \Rightarrow \sqrt{3} - \sqrt{x} = \sqrt{y-1}$
 $\Rightarrow \sqrt{y-1} \geq 0 \Rightarrow x \in [0, 3] \Rightarrow D_f = [0, 3]$ ✓ 2

الف) $y = \sqrt{\frac{x^2 - 2x + 2}{x^2 - 10x + 16}} \Rightarrow x = 1, 2 \rightarrow$
 $(\mathbb{R} - \{2\}) \cap (\mathbb{R} - (1, 2)) = \mathbb{R} - (1, 2]$
 $D_f = \mathbb{R} - (1, 2]$ 9
 ب) $y = \sqrt{\frac{x^2 - 2x + 2}{x^2 - 10x + 16}} \Rightarrow x = 1, 2, 4, 8$
 $D_f = \mathbb{R} - ((1, 2] \cup (4, 8])$ ✓

الف) $y = \sqrt{\frac{x^2 - 2x + 2}{x^2 - 10x + 16}} \Rightarrow x = \frac{2}{3}, \frac{4}{3} \rightarrow$
 $(\mathbb{R} - (1, \frac{2}{3}]) \cap (\mathbb{R} - [1, \frac{4}{3}]) = \mathbb{R} - [1, \frac{4}{3}]$
 $D_f = \mathbb{R} - ([1, \frac{4}{3}] \cup [\frac{2}{3}, 1])$ ✓ 2
 ب) $y = \sqrt{\frac{x^2 - 2x + 2}{x^2 - 10x + 16}} \Rightarrow x = (\frac{2}{3}, \frac{4}{3}) \cup (\frac{4}{3}, 1)$
 $D_f = \mathbb{R} - ((\frac{2}{3}, \frac{4}{3}) \cup (\frac{4}{3}, 1))$ ✓