

(الف) $4x^2 - 5x - 6 \rightarrow x^2 - 5x - 34 = 0 \rightarrow (x-9)(x+4) = 0$ (1)
 $\rightarrow x = \begin{cases} \frac{9}{4} = \frac{3}{1} \\ -\frac{4}{1} = -\frac{4}{1} \end{cases}$

(ب) $3x^2 - 11x - 3 = 0 \rightarrow x^2 - 11x - 9 = 0 \rightarrow (x-9)(x+1) = 0 \rightarrow x = \begin{cases} \frac{9}{1} = 9 \\ -\frac{1}{1} = -1 \end{cases}$

(ج) $4x^2 - 4x - 3 = 0 \rightarrow x^2 - 4x - 12 = 0 \rightarrow (x-4)(x+3) = 0 \rightarrow x = \begin{cases} \frac{4}{1} = 4 \\ -\frac{3}{1} = -3 \end{cases}$

(د) $2x^2 - 5x - 12 = 0 \rightarrow x^2 - 5x - 24 = 0 \rightarrow (x-1)(x+3) = 0$
 $\rightarrow x = \begin{cases} \frac{1}{1} = 1 \\ -\frac{3}{1} = -3 \end{cases}$

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

(ب) $2x^2 + 5x + 3 = 0 \xrightarrow{2+3=5} x = \begin{cases} -1 \\ -\frac{3}{2} \end{cases}$

(ج) $x^2 + 2x + 3 = 0 \rightarrow (x+1)(x+3) = 0 \rightarrow x = \begin{cases} -1 \\ -3 \end{cases}$

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

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

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

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

$m^2 = m+2 \rightarrow m^2 - m - 2 = 0 \rightarrow (m-2)(m+1) = 0 \rightarrow m = \begin{cases} -1 \checkmark \\ 2 \times \end{cases}$
 $\rightarrow X(2, 1), (2, 4)$

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

$m^2 = m+2 \rightarrow m^2 - m - 2 = 0$
 $\rightarrow m = \begin{cases} 2 \checkmark \\ -1 \times \end{cases}$
 $\rightarrow (-1, 4), (-1, 3) \times$

$f(x) = \{(1, a^2), (1, 3a-2), (a^2, 3a+2)\}$ (5)

$a^2 = 3a-2 \rightarrow a^2 - 3a + 2 = 0 \xrightarrow{1-3+2=0} a = \begin{cases} 1 \rightarrow \{(1,1), (1,1), (1,5)\} \times \\ 2 \rightarrow \{(1,4), (1,4), (4,1)\} \checkmark \end{cases}$
 $a = 2$

$$f(x) = \begin{cases} x^2-1 & x < 1 \\ ax+b & 1 \leq x \leq 2 \\ x^2 & x \geq 2 \end{cases} \quad \left. \begin{array}{l} \text{if } x=1 \rightarrow x^2-1=0 \rightarrow 1-1=a+b=0 \\ \text{if } x=2 \rightarrow ax+b=x^2 \rightarrow 2a+b=1 \end{array} \right\} \begin{array}{l} a=1 \\ b=-1 \end{array}$$

$$a \times b = 1(-1) = -1$$

$$f(x) = \begin{cases} 2x-3 & x \geq k \\ 4-3x & x < k \end{cases} \quad \left. \begin{array}{l} \text{if } x=k \rightarrow 2x-3=4-3x \\ \Rightarrow 5x=7 \rightarrow x=\frac{7}{5} \end{array} \right\} k=\frac{7}{5}$$

(الف) $y^3 - 4y = x^2 - 4x + 3 \xrightarrow{x=1} y^3 - 4y = 0 \rightarrow y = \begin{cases} 0 \\ \sqrt{4} \\ -\sqrt{4} \end{cases}$ تابع نیست

(ب) $|x| + |y| = 3 \xrightarrow{x=0} |y| = 3 \rightarrow y = \begin{cases} 3 \\ -3 \end{cases}$ تابع نیست

(ج) $|y| = \sqrt{1 - \cos x} \xrightarrow{x=\frac{\pi}{2}} |y| = \sqrt{1-0} = \sqrt{1} = 1 \rightarrow y = \begin{cases} 1 \\ -1 \end{cases}$ تابع نیست

(د) $y^2 + x^2 + 2x + 1 = 0 \rightarrow y^2 = -(x^2 + 2x + 1) \rightarrow y^2 = -(x+1)^2$ و y^2 مثبت و $-(x+1)^2$ همیشه منفی است. به جز زمانی که $x = -1$ که صفر می شود پس این رابطه فقط یک نقطه (0 و -1) را نشان می دهد پس تابع است.

(الف) $\sqrt[3]{y} = -x^2 + 2x - 2 \rightarrow \sqrt[3]{y_1} = -x_1^2 + 2x_1 - 2$
 $\sqrt[3]{y_2} = -x_2^2 + 2x_2 - 2$
 if $x_1 = x_2 \xrightarrow{y_1=y_2} \sqrt[3]{y_1} = \sqrt[3]{y_2} \xrightarrow{\text{پس توان 3}} y_1 = y_2$ تابع است

(ب) $y^3 + 2y = 5x \rightarrow \begin{cases} y_1^3 + 2y_1 = 5x_1 \\ y_2^3 + 2y_2 = 5x_2 \end{cases} \quad \left. \begin{array}{l} \text{if } x_1 = x_2 \\ y_1 = y_2 \end{array} \right\} y_1^3 + 2y_1 = y_2^3 + 2y_2$
 $\rightarrow y_1^3 - y_2^3 = 2(y_2 - y_1) \rightarrow (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2) + 2(y_1 - y_2) = 0$
 $\rightarrow (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2 + 2) = 0 \quad y_1 = \frac{-y_2 \pm \sqrt{y_2^2 - 4y_2^2 - 4}}{2} \rightarrow \Delta = -3y_2^2 - 4$
 Δ همیشه منفی است پس ریشه دوم صفر نمی شود پس برانتز اول صفر بوده $y_1 = y_2$ در نتیجه $y_1 = y_2$ است و ضابطه تابع است.

(الف) $x \sin y = y \sin x \xrightarrow{x=0} x \sin y = 0 \times \sin y = 0$ در نتیجه $y \sin x = y \times 0 = 0$ اگر $x=0$ و y می تواند هر چیزی باشد پس تابع نیست

(ب) $\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}} = 2 \xrightarrow{\text{پس توان 2}} \frac{x}{y} + \frac{y}{x} + 2 = 4 \rightarrow \frac{x^2 + y^2}{xy} = 2 \xrightarrow{\text{پس توان } xy} x^2 + y^2 = 2xy \rightarrow x^2 + y^2 - 2xy = 0 \rightarrow (x-y)^2 = 0 \Rightarrow x=y$ تابع است