

الف) $4x^2 - 5x - 4 = 0$ $x^2 - 5x - 16 = 0$ $(x-9)(x+4) = 0$ $\begin{cases} x = -4 \\ x = 9 \end{cases} \xrightarrow{\div 4} -\frac{1}{3}, \frac{3}{2}$ $\leftarrow$ ریشه ها ب) $3x^2 - 8x - 3 = 0$ $x^2 - 8x - 9 = 0$ $(x+1)(x-9) = 0$ $\begin{cases} x = 9 \\ x = -1 \end{cases} \xrightarrow{\div 3} 3, -\frac{1}{3}$ $\leftarrow$ ریشه ها ج) $4x^2 - 4x - 3 = 0$ $x^2 - 4x - 12 = 0$ $(x-4)(x+3) = 0$ $\begin{cases} x = -3 \\ x = 4 \end{cases} \xrightarrow{\div 4} -\frac{3}{4}, \frac{1}{2}$ $\leftarrow$ ریشه ها د) $2x^2 - 5x - 12 = 0$ $x^2 - 5x - 24 = 0$ $(x-8)(x+3) = 0$ $\begin{cases} x = -3 \\ x = 8 \end{cases} \xrightarrow{\div 2} -\frac{3}{2}, 4$ $\leftarrow$ ریشه ها	۱
الف) $x^2 - 5x - 14 = 0$ $(x-7)(x+2) = 0$ $\begin{cases} x = 7 \\ x = -2 \end{cases} \leftarrow$ ریشه ها ب) $2x^2 + 5x + 3 = 0$ $\frac{-5 \pm \sqrt{25 - 4 \cdot 2 \cdot 3}}{4} \rightarrow \begin{cases} x = \frac{-5+1}{4} = -1 \\ x = \frac{-5-1}{4} = -\frac{3}{2} \end{cases}$ ج) $x^2 + 4x + 3 = 0$ $\frac{-4 \pm \sqrt{16 - 4 \cdot 1 \cdot 3}}{2} \rightarrow \Delta < 0$ $\leftarrow$ ریشه ها د) $3x^2 + 13x - 2 = 0$ $\frac{-13 \pm \sqrt{169 - 4 \cdot 3 \cdot (-2)}}{6} \rightarrow \frac{-13 \pm \sqrt{145}}{6} \rightarrow x = -\frac{1}{3} \pm \frac{\sqrt{145}}{6}$	۲
$A \times B = \{(1,2)(1,3)(2,2)(2,3)(3,2)(3,3)\}$ $B \times B = \{(2,2)(2,3)(3,3)(3,2)\}$ $\rightarrow A \times B - B = \{(1,2)(1,3)\}$	۳
الف) $f(n) = \{(1, m^2)(2, m^2)(-3, m)(-2, m)(3, m+2)(m, 4)\}$ $m^2 = m+2 \rightarrow m^2 - m - 2 = 0$ $\begin{cases} m = -1 \\ m = 2 \end{cases}$ $\checkmark$ ب) $g(n) = \{(1, m^2)(2, 1)(m, 4)(3, m+2)(-2, m)(-1, 3)\}$ $m^2 = m+2 \rightarrow m^2 - m - 2 = 0$ $\begin{cases} m = -1 \\ m = 2 \end{cases}$ $\checkmark$	۴
$f(n) = \{(1, a^2)(1, 2a-2)(a^2, 3a+2)\}$ $2a-2 = a^2 \rightarrow a^2 - 2a + 2 = 0 \rightarrow (a-1)(a-2) = 0$ $\begin{cases} a = 2 \checkmark \rightarrow \{(1, 4)(1, 4)(4, 8)\} \Rightarrow a = 2 \\ a = 1 \checkmark \rightarrow \{(1, 1)(1, 1)(1, 3)\} \end{cases}$	۵

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

$$n=2 \rightarrow n^2 = an + b \rightarrow 1 = 2a + b$$

$$n=1 \rightarrow n^2 - 1 = an + b \rightarrow 1 - 1 = a + b \rightarrow a + b = 0$$

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

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

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

$$2n - 3 = 2 - 3n \rightarrow 2K - 3 = 2 - 3K \rightarrow -5K = -5 \rightarrow 5K = 5 \rightarrow K = \frac{5}{5}$$

$$\text{الف) } y^3 - 4y = x^2 - 4x + 3 \quad x^2 - 4x + 3 = (x-2)^2 - 1 \rightarrow y^3 - 4y = (x-2)^2 - 1 \quad \text{تابع نیست}$$

$$\text{ب) } |x| + |y| = 3 \quad \text{نقطه} \rightarrow x=1 \rightarrow 1 + |y| = 3 \rightarrow |y| = 2 \rightarrow \begin{matrix} y = -2 \\ y = 2 \end{matrix} \quad \text{تابع نیست}$$

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

$$\text{د) } y^2 + x^2 + 2x + 1 = 0 \quad y^2 + (x+1)^2 = 0 \rightarrow y = 0 \quad \checkmark \quad \text{تابع هست}$$

$$\text{الف) } \sqrt[3]{y} + x^2 = 2x - 2 \quad \begin{cases} \sqrt[3]{y_1} = 2x - 2 - x^2 \rightarrow \sqrt[3]{y_1} = \sqrt[3]{y_2} \rightarrow y_1 = y_2 \\ \sqrt[3]{y_2} = 2x - 2 - x^2 \end{cases} \quad \checkmark \quad \text{تابع هست}$$

$$\text{ب) } y^3 + xy = \Delta x \quad \begin{cases} y_1^3 + xy_1 = \Delta x \\ y_2^3 + xy_2 = \Delta x \end{cases} \rightarrow y_1^3 + xy_1 = y_2^3 + xy_2 \rightarrow y_1^3 - y_2^3 + xy_1 - xy_2 = 0$$

$$\rightarrow (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2) + x(y_1 - y_2) = 0 \rightarrow (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2 + x) = 0$$

$$y_1 - y_2 = 0 \rightarrow y_1 = y_2 \quad \checkmark \quad \text{تابع هست}$$

$$y_1 = \frac{-y_2 \pm \sqrt{y_2^2 + 4x(y_2^2 + y_2 + 2)}}{2}$$

$$\text{الف) } x \sin y = y \sin x$$

$$x=0 \rightarrow 0 \times \sin y = y \sin 0 \rightarrow 0=0$$

$$\text{تابع نیست} \quad \text{بلکه } x=0 \text{ هر } y \text{ در جواب من } \rightarrow y=\pi, y=2, y=1$$

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

$$\frac{x}{y} + \frac{y}{x} + 2\left(\frac{x}{y} \times \frac{y}{x}\right) = 4 \rightarrow \frac{x^2 + y^2 - 2xy}{xy} = 0 \rightarrow \frac{(x-y)^2}{xy} = 0$$

$$\rightarrow (x-y)^2 = 0 \rightarrow x=y \quad \checkmark \quad \text{تابع هست}$$