

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

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

ج) $4x^2 - 12x - 3 = 0 \rightarrow x^2 - 3x - 12 = 0 = (x-6)(x+2) \rightarrow x \begin{cases} 6 \rightarrow \frac{6}{4} = 3/2 \\ -2 \rightarrow -\frac{2}{4} = -1/2 \end{cases}$

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

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

ب) $2x^2 + 5x + 3 = 0 \rightarrow x^2 + 5x + 4 = (x+2)(x+3) = 0 \rightarrow x = \begin{cases} -2 \rightarrow \frac{-2}{2} = -1 \\ -3 \rightarrow \frac{-3}{2} = -1/2 \end{cases}$

ج) $x^2 + 2x + 3 = 0 \rightarrow x^2 + 2x + 1 = -2 \rightarrow (x+1)^2 = -2 \rightarrow \text{ریشه ندارد}$

د) $3x^2 + 3x - 2 = 0 \rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow \frac{-3 \pm \sqrt{9 + 24}}{6} \rightarrow \frac{-3 \pm \sqrt{33}}{6}$

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

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

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

الف) $f(x) = \{(3, m^2), (2, 1), (-3, m), (-2, m), (3, m+2), (m, 4)\}$ این جواب غیر قابل قبول است چون بار عددی ۶ در فرجه ۴ داریم

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

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

$m^2 = m+2 \rightarrow m^2 - m - 2 = 0 \Rightarrow m = \begin{cases} 2 \\ -1 \end{cases}$

به انشای هیچ m این رابطه تابع نمی شود

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

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

یک مقدار

تابع نیست

$f(x) = \{(1, 1), (1, 1), (1, 5)\}$

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

$$\left. \begin{aligned} f(1) = x^2 - 1 = ax + b \rightarrow a + b = 0 \\ f(r) = x^r = ax + b \rightarrow 1 = r + b \end{aligned} \right\} \Rightarrow \begin{aligned} a &= 1 \\ b &= -1 \end{aligned}$$

$$a \times b = -9^{\frac{1}{4}}$$

$$f(x) = \begin{cases} rx - r & x \geq k \\ k - rx & x \leq k \end{cases}$$

$$f(k) = rx - r = k - rx \rightarrow rk - r = k - rk \Rightarrow \omega k = r \Rightarrow k = \frac{r}{\omega} = \frac{1}{1/k}$$

$$\text{الف) } y^3 - 6y = x^2 - 4x + 3$$

$$\text{If } x=1 \Rightarrow y^3 - 6y = 1 - 4 + 3 = 0 \rightarrow y^2(y-6) = 0 \Rightarrow \begin{aligned} y &= 0 \text{ تابع نیست } \times \\ y &= 6 \end{aligned}$$

$$\text{ب) } |x| + |y| = 3 \quad \text{If } x=0 \Rightarrow |y| = 3 \Rightarrow y = \pm 3 \text{ تابع نیست } \times$$

$$\text{ج) } |y| = \sqrt{1 - \cos x} \quad \text{If } \cos x = \frac{1}{4} \Rightarrow |y| = \sqrt{\frac{3}{4}} \Rightarrow y = \pm \sqrt{\frac{3}{4}} \text{ تابع نیست } \times$$

$$\text{د) } y^4 + x^2 + 2x + 1 = 0 \Rightarrow y^4 + (x+1)^2 = 0 \Rightarrow \begin{aligned} \text{جمع دو چیز نامنفی} &\Rightarrow y=0 \\ \text{مضرب شمرده صفر در صفر است} &\Rightarrow x=-1 \end{aligned} \Rightarrow \begin{aligned} \text{نقطه} &\text{ تابع است } \checkmark \end{aligned}$$

$$\text{الف) } \sqrt[3]{y + x^2} = 2x - 2 \rightarrow \sqrt[3]{y} = -x^2 + 2x - 2 = -(x-1)^2 - 1$$

$$\begin{aligned} \sqrt[3]{y_1} &= -(x-1)^2 - 1 \\ \sqrt[3]{y_2} &= -(x-1)^2 - 1 \end{aligned} \rightarrow \sqrt[3]{y_1} = \sqrt[3]{y_2} \rightarrow \boxed{y_1 = y_2} \text{ تابع است}$$

$$\text{ب) } y^3 + 2y = \omega x$$

$$\begin{aligned} y_1^3 + 2y_1 &= \omega x \\ y_2^3 + 2y_2 &= \omega x \end{aligned} \Rightarrow y_1^3 + 2y_1 = y_2^3 + 2y_2 \rightarrow y_1^3 - y_2^3 = 2y_2 - 2y_1 \Rightarrow (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2) = 2(y_2 - y_1) \Rightarrow \begin{aligned} y_1 - y_2 &= 0 \Rightarrow y_1 = y_2 \text{ تابع است } \checkmark \\ y_1^2 + y_1y_2 + y_2^2 + 2 &= 0 \end{aligned}$$

$$\text{الف) } x \sin y = y \sin x \rightarrow \text{If } x=0 \Rightarrow \sin x = 0 \Rightarrow y = 1R \text{ تابع نیست}$$

$$\text{ب) } \sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}} = 2 \xrightarrow{\frac{x}{y} = t} \sqrt{t} + \sqrt{\frac{1}{t}} = 2 \rightarrow t + \frac{1}{t} + 2\sqrt{t} = 4 \Rightarrow t + \frac{1}{t} = 2$$

$$\Rightarrow t = 1, \frac{1}{t} = 1 \Rightarrow \frac{x}{y} = 1, \frac{y}{x} = 1 \Rightarrow x = 1, y = 1 \rightarrow \text{نقطه} \Rightarrow \text{تابع است}$$