

$0 = 4x^2 - 0x - 6 \rightarrow x^2 - 0x - 3/2 = 0 \rightarrow (x-3/2)(x+1) = 0 \Rightarrow 4(x-3/2)(x+1) = 0$
 (الف) ریشه ها: $3/2$ و -1

$2x^2 - 12x - 2 = 0 \rightarrow x^2 - 6x - 1 = 0 \xrightarrow{a+c=b} \text{ریشه ها: } 9 \text{ و } -1 \Rightarrow \sqrt{\frac{1}{4} \pm \frac{3}{4}} \Rightarrow 2(x+1/2)(x-9/2)$
 (ب) ریشه ها: $-1/2$ و $9/2$

$4x^2 - 8x - 2 = 0 \rightarrow x^2 - 2x - 1/2 = 0 \rightarrow (x-1)(x+1/2) = 0 \Rightarrow 2(x-1/2)(x+1/2)$
 (د) ریشه ها: $-1/2$ و $1/2$

$x^2 - 0x - 12 = 0 \rightarrow (x-4)(x+3) = 0$
 (الف) ریشه ها: 4 و -3

$2x^2 + 0x + 3 = 0 \xrightarrow{a+c=b} \text{ریشه ها: } -3/2 \text{ و } 3/2$
 (ب) ریشه ها: $-3/2$ و $3/2$

$x^2 + 2x + 3 = 0 \quad \Delta = b^2 - 4ac = 4 - 12 = -8 < 0 \quad \Delta < 0$
 (ج) ریشه حقیقی ندارد

$2x^2 + 5x - 2 = 0 \quad x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-5 \pm \sqrt{25 + 16}}{4} = \frac{-5 \pm \sqrt{41}}{4}$
 (د) ریشه ها: $\frac{-5 + \sqrt{41}}{4}$ و $\frac{-5 - \sqrt{41}}{4}$

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

$f(x) = \{(2, m), (1, 4), (-2, m), (-3, m), (3, m+2), (m, 4)\}$
 $m^2 = m+2 \Rightarrow m^2 - m - 2 = 0 \xrightarrow{a+c=b} m \in \{-1, 2\}$

$f(x) = \{(2, m), (1, 4), (3, m+2), (-2, m), (-3, m), (m, 4)\}$
 $m^2 = m+2 \Rightarrow m^2 - m - 2 = 0 \xrightarrow{a+c=b} m \in \{-1, 2\}$
 در صورت تابع بودن یک مجموعه باید هر مرتبه به ازای درجه اول یکسان درایه ها داشته باشد

$f(x) = \{(1, a^2), (a^2, a+2)\} \xrightarrow{if \ a=1} f(x) = \{(1, 1), (1, 3)\}$
 $a^2 = a+2 \Rightarrow a^2 - a - 2 = 0 \xrightarrow{a+b+c=0} a = 2 \Rightarrow \boxed{a=2}$

$$f(x) = \begin{cases} x^2 - 1 & x \leq 1 \\ ax + b & 1 < x \leq 2 \\ x^2 & x > 2 \end{cases} \quad \left\{ \begin{array}{l} \text{if } x=1: x^2 - 1 = ax + b = \boxed{a+b} \\ \text{if } x=2: x^2 = ax + b = \boxed{1=2a+b} \end{array} \right\} \Rightarrow \boxed{\begin{matrix} a=1 \\ b=-1 \end{matrix}} \quad \boxed{ab=-96}$$

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$$f(x) = \begin{cases} 2x-1 & x \geq k \\ x-2 & x \leq k \end{cases} \quad \left\{ \begin{array}{l} \text{if } x=k: 2x-1 = x-2 \Rightarrow 0x = -1 \Rightarrow \boxed{x=k=1, f=\frac{1}{2}} \end{array} \right.$$

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$$y^2 - 4y = x^2 - 6x + 3 \xrightarrow{x=1} y^2 - 4y = 0 = y(y-4) \Rightarrow \boxed{y=0, \pm\sqrt{4}} \quad \text{الف) تابع نیست}$$

$$|x| + |y| = 3 \xrightarrow{x=0} |y| = 3 \quad \boxed{y = \pm 3} \quad \text{ب) تابع نیست}$$

$$|y| = \sqrt{1 - \cos x} \xrightarrow{x=\frac{\pi}{2}} |y| = \sqrt{1} = 1 \quad \boxed{y = \pm 1} \quad \text{ج) تابع نیست}$$

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$$y^2 + x^2 + 2x + 1 = 0 \quad y^2 = -(x^2 + 2x + 1) = y^2 = -(\overset{\text{نشان}}{x+1})^2 \Rightarrow \boxed{\frac{y}{x+1} = 0} \quad \text{د) تابع است}$$

$$\left\{ \begin{array}{l} \sqrt{y_1} = -x^2 + 2x - 1 \\ \sqrt{y_2} = -x^2 + 2x - 2 \end{array} \right\} \quad \sqrt{y_1} = \sqrt{y_2} \xrightarrow{\text{مربع}} y_1 = y_2$$

$$\boxed{\text{الف) تابع است}}$$

$$\left\{ \begin{array}{l} y_1^2 + y_2^2 = 0x_1 \\ y_1^2 + y_2^2 = 0x_2 \end{array} \right\} \quad \text{if } x_1 \neq x_2 \Rightarrow y_1 = y_2 \Rightarrow y_1^2 + y_2^2 = y_1^2 + y_1^2 \quad (y_1 - y_2)(y_1^2 + y_1 y_2 + y_2^2 + 2) = 0 \Rightarrow \boxed{y_1 = y_2} \quad \text{ب) تابع است}$$

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$$x \sin y = f \sin x \xrightarrow{x=0} f \sin 0 = 0 \rightarrow f \in \mathbb{R} \quad \text{الف) تابع نیست}$$

$$\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}} = 2 \xrightarrow{\text{مربع}} \frac{x}{y} + \frac{y}{x} + 2\sqrt{\frac{xy}{xy}} = 4 \quad \boxed{\frac{x}{y} + \frac{y}{x} = 2} \quad \begin{array}{l} \boxed{x=y} \leftarrow (x-y)^2 = 0 \\ x^2 + y^2 = 2xy \quad x^2 + y^2 + 2xy = 0 \\ \frac{x^2 + y^2}{xy} = 2 \end{array} \quad \text{ب) تابع نیست}$$

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x