

الف) $6x^2 - 5x - 6 \rightarrow x^2 - 5x - 36 = (x-9)(x+4) \rightarrow (x-\frac{9}{6})(x+\frac{4}{6}) = 0$
 $x = \frac{9}{6} = \frac{3}{2}$ $x = -\frac{4}{6} = -\frac{2}{3}$
 ب) $3x^2 - 11x - 2 \rightarrow x^2 - 11x - 9 = (x-9)(x+1) \rightarrow (x-\frac{9}{3})(x+\frac{1}{3}) = 0$
 $x = \frac{9}{3} = 3$ $x = -\frac{1}{3}$
 ج) $4x^2 - 4x - 3 \rightarrow x^2 - 4x - 12 = (x-6)(x+2) \rightarrow (x-\frac{6}{4})(x+\frac{2}{4}) = 0$
 $x = \frac{6}{4} = \frac{3}{2}$ $x = -\frac{2}{4} = -\frac{1}{2}$
 د) $2x^2 - 5x - 12 \rightarrow x^2 - 5x - 24 = (x-1)(x+3) \rightarrow (x-\frac{1}{2})(x+\frac{3}{2}) = 0$
 $x = \frac{1}{2}$ $x = -\frac{3}{2}$

الف) $x^2 - 5x - 14 = (x-7)(x+2) = 0 \Rightarrow x-7=0 \quad x+2=0$
 $x=7 \quad x=-2$
 ب) $2x^2 + 5x + 2 \Rightarrow x^2 + 5x + 6 = 0 = (x+2)(x+3) \rightarrow (x+\frac{2}{2})(x+\frac{3}{2}) = 0$
 $x = -1 \quad x = -\frac{3}{2}$

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

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

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

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

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

الف) $f(x) = \{(3, m^2), (2, 1), (-3, m), (-2, m), (3, m+2), (m, 4)\}$
 $m^2 = m+2 \Rightarrow m^2 - m - 2 = 0 \quad (m-2)(m+1) = 0$
 $m = 2 \rightarrow (2, 1), (2, 4)$
 $m = -1 \rightarrow (-1, 3), (-1, 4)$

ب) $g(x) = \{(3, m^2), (2, 1), (m, 4), (3, m+2), (-2, m), (-1, 3)\}$
 $m^2 = m+2 \Rightarrow m^2 - m - 2 = 0$
 $(m-2)(m+1) = 0$
 $m = 2 \rightarrow (2, 1), (2, 4)$
 $m = -1 \rightarrow (-1, 3), (-1, 4)$

$f(x) = \{(1, a^2), (1, 3a-2), (a^2, 3a+2)\}$
 $a^2 = 3a-2 \Rightarrow a^2 - 3a + 2 = 0$
 $(a-2)(a-1) = 0$
 $a = 2 \rightarrow (1, 4), (4, 1)$
 $a = 1 \rightarrow (1, 1), (1, 5)$

غیر تابع نیست

$$f(x) = \begin{cases} x^2 - 1 & x \leq 1 \\ ax + b & 1 \leq x \leq 2 \\ x^3 & x \geq 2 \end{cases}$$

$$x=2 \Rightarrow y = (2)^3 = (2)a + b \\ 2a + b = 8$$

$$x=1 \Rightarrow y = (1)^2 - 1 = (1)a + b \\ \begin{cases} 2a + b = 8 \\ -a + b = 0 \end{cases} \Rightarrow \begin{cases} a = 1 \\ b = -1 \end{cases} \\ a \times b = 1 \times (-1) = \boxed{-1}$$

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$$f(x) = \begin{cases} 2x - 3 & x \geq k \\ 8 - 3x & x \leq k \end{cases}$$

$$x=k \Rightarrow y = 2(k) - 3 = 8 - 3(k)$$

$$2k - 3 = 8 - 3k$$

$$5k = 11$$

$$\boxed{k = \frac{11}{5}}$$

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الف) $y^3 - 4y = x^2 - 4x + 3 \quad x=1 \Rightarrow y^3 - 4y = 0 \quad y^3 = 4y \quad y^2 = 4$
 $y = \pm \sqrt{4}$ تابع است

ب) $|x| + |y| = 3 \quad x=0 \Rightarrow |y| = 3$
 $y = \pm 3$ تابع است

ج) $|y| = \sqrt{1 - \cos x} \quad -1 \leq \cos x \leq 1 \quad 1 \geq -\cos x \geq -1 \quad 2 \geq 1 - \cos x \geq 0$
 $x = \pi \Rightarrow |y| = \sqrt{2}$

$$\boxed{y = \pm \sqrt{2}} \text{ تابع است}$$

د) $y^2 + x^2 + 2x + 1 = 0$
 $y^2 + (x+1)^2 = 0$
 $x = -1, y = 0$ تابع است

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الف) $\sqrt[3]{y} + x^2 = 2x - 2 \quad \sqrt[3]{y_1} = -x^2 + 2x - 2 \quad \sqrt[3]{y_1} = \sqrt[3]{y_2} \rightarrow y_1 = y_2$
 $\sqrt[3]{y_2} = -x^2 + 2x - 2$ تابع است

ب) $\sqrt[3]{y} + 2y = 5x$
 $\begin{cases} y_1^3 + 2y_1 = 5x \\ y_2^3 + 2y_2 = 5x \end{cases} \Rightarrow \begin{cases} y_1^3 + 2y_1 = y_2^3 + 2y_2 \\ (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2) = -2(y_1 - y_2) \end{cases}$
 $(y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2 + 2) = 0$
 $y_1 - y_2 = 0 \Rightarrow y_1 = y_2$ تابع است

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الف) $x \sin y = y \sin x \quad x=0 \rightarrow 0 \times \sin y = 0 \times y \quad y = 0, \pi, 2\pi, \dots$
 $y = 0$ تابع است

ب) $\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}} = 4$

$$\frac{x^2 + y^2}{2xy} = 4 \Rightarrow x^2 + y^2 = 8xy$$

$$x^2 - 8xy + y^2 = 0$$

$$(x - y)^2 = 0 \Rightarrow x = y$$
 تابع است

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ج) $\frac{x}{y} + \frac{y}{x} + 1 \sqrt{\frac{x}{y} \times \frac{y}{x}} = 6 \Rightarrow \frac{x}{y} + \frac{y}{x} = 5$