

الف) $4x^2 - 5x - 7 = 0 \Rightarrow x^2 - 5x - 37 = 0 \rightarrow (x-9)(x+4) = 0 \rightarrow \begin{cases} x = \frac{9}{1} = 9 \\ x = \frac{-4}{1} = -4 \end{cases}$

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

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

د) $2x^2 - 5x - 12 = 0 \Rightarrow x^2 - 5x - 24 = 0 \rightarrow (x-8)(x+3) = 0 \rightarrow \begin{cases} x = \frac{8}{1} = 8 \\ x = \frac{-3}{1} = -3 \end{cases}$

الف) $x^2 - 5x - 12 = 0 \rightarrow (x-8)(x+3) = 0 \rightarrow \begin{cases} x = 8 \\ x = -3 \end{cases}$

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

ج) $x^2 + 2x + 3 = 0 \rightarrow \Delta = b^2 - 4ac = 4 - 12 = -8 < 0 \rightarrow$ ریشه ندارد
 د) $10x^2 + 13x - 2 = 0 \rightarrow x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-13 \pm \sqrt{9 - (-2 \times 10)}}{20} \rightarrow \begin{cases} \frac{-13 + \sqrt{29}}{20} \Rightarrow \frac{-1}{4} + \frac{\sqrt{29}}{20} \\ \frac{-13 - \sqrt{29}}{20} \Rightarrow \frac{-1}{4} - \frac{\sqrt{29}}{20} \end{cases}$

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

الف) $f(x) = \{(3, m^2), (2, 1), (-3, m), (-2, m), (3, m+2), (m, 4)\}$
 $m^2 = m+2 \rightarrow m^2 - m - 2 = 0 \rightarrow (m-2)(m+1) = 0 \rightarrow \begin{cases} m = 2 \\ m = -1 \end{cases}$
 وقتی $m = 2$ شود $(2, 4) \neq (2, 1)$

ب) $g(x) = \{(3, m^2), (2, 1), (m, 4), (3, m+2), (-2, m), (-1, 3)\}$
 $m^2 = m+2 \rightarrow m^2 - m - 2 = 0 \rightarrow (m-2)(m+1) = 0 \rightarrow \begin{cases} m = -1 \\ m = 2 \end{cases}$
 وقتی $m = -1$ شود $(-1, 4) \neq (-1, 3)$
 وقتی $m = 2$ شود $(2, 1) \neq (2, 4)$

$f(x) = \{(1, a^2), (1, 3a+2), (a^2, 3a+2)\}$
 $a^2 = 3a+2 \rightarrow a^2 - 3a - 2 = 0$
 $(a-4)(a+1) = 0 \rightarrow a = 4 \rightarrow \{(1, 1), (1, 1), (1, 18)\} \times$
 $\boxed{a = -1} \rightarrow \{(1, 2), (1, 2), (1, 1)\} \checkmark$

$$f(x) = \begin{cases} x^{r-1} & x \leq 1 \\ ax+b & 1 \leq x \leq r \\ x^r & x > r \end{cases} \quad \begin{cases} x=1 \\ x=r \end{cases} \rightarrow \begin{cases} 0 = a+b \rightarrow a = -b \\ ra+b = 1 \\ r(-b)+b=1 \rightarrow -rb+b=1 \rightarrow -b = \frac{1}{1-r} \\ b = -\frac{1}{1-r} \rightarrow a = \frac{1}{1-r} \end{cases}$$

$$a \times b = \frac{1}{1-r} \times -\frac{1}{1-r} = -\frac{1}{(1-r)^2}$$

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$$f(x) = \begin{cases} rx - r^2 & x > r \\ r - rx & x \leq r \end{cases} \rightarrow \begin{cases} rx - r^2 = r - rx \\ 0x = \frac{1}{r} \\ r = x = \frac{1}{\omega} \end{cases}$$

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الف) $y^3 - 4y = x^2 - 4x + 4 \xrightarrow{x=1} y(y^2 - 4) = 0 \xrightarrow{y=0} y^2 - 4 = 0 \rightarrow y^2 = 4 \rightarrow y = \pm 2$ $\times$ نتایج

ب) $|x| + |y| = 3 \xrightarrow{x=0} |y| = 3 \rightarrow y = \pm 3$ $\times$ نتایج

ج) $|y| = \sqrt{1 - \cos x} \rightarrow 1 - \cos x > 0 \Rightarrow 1 > \cos x \checkmark$ $\times$ نتایج

د) $y^2 + x^2 + 2x + 1 = 0 \rightarrow y^2 + (x+1)^2 = 0 \rightarrow y=0, x=-1$ $\checkmark$ نتایج

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الف) $\sqrt[3]{y} + x^2 = 2x - 2 \rightarrow \sqrt[3]{y} = -x^2 + 2x - 2 \xrightarrow{y=0} -x^2 + 2x - 2 = -x^2 + 2x - 2 \Rightarrow \sqrt[3]{y_1} = \sqrt[3]{y_2} \rightarrow y_1 = y_2$ $\checkmark$ نتایج

ب) $x^3 + 2y = 0 \rightarrow x_1^3 = 0, x_2^3 = 0 \Rightarrow y_1^3 + 2y_1 = y_2^3 + 2y_2$ $\checkmark$ نتایج

$\rightarrow y_1^3 - y_2^3 + 2y_1 - 2y_2 = 0 \rightarrow (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2) + 2(y_1 - y_2) = 0 \rightarrow (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2 + 2) = 0$

$\hookrightarrow y_1 = y_2 \quad y_1^2 + y_1y_2 + y_2^2 + 2 = 0 \rightarrow \Delta = y_1^2 - (4x(y_1^2 + 2) \times 1) = -4y_1^2 - 8 \Delta < 0$

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الف) $x \sin y = y \sin x \xrightarrow{x=0} 0 \times \sin y = y \times 0$ $\times$ نتایج

ب) $\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}} = 2 \xrightarrow{x=y}$ $\checkmark$ نتایج

چون دو طرف معادله را با هم ضرب می‌کنیم به دست می‌آوریم $x=y$ $\checkmark$ نتایج

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الف) $\sqrt{\frac{x}{y}} = a \rightarrow a + \frac{1}{a} = 2 \rightarrow a^2 - 2a + 1 = 0 \rightarrow (a-1)^2 = 0 \rightarrow a=1 \rightarrow \sqrt{\frac{x}{y}} = 1 \rightarrow x=y$