

$$1- (f+g)' = f' + g' + f'g$$

$$f' + g' = (x + \sqrt{x-1}) + (x - \sqrt{x-1}) = 2x$$

$$f'g = \sqrt{(x+1)\sqrt{x-1}} \sqrt{(x-1)\sqrt{x-1}} = \sqrt{x^2 - 14(x-1)} = \sqrt{x^2 - 14x + 14} = \sqrt{(x-1)^2} \xrightarrow{x \geq 1} x-1$$

$$(f+g)' = 2x + (x-1) = 3x-1 = f(x) \rightarrow a+b, c, -f \rightarrow \frac{a+b}{c} = \frac{-1}{3}$$

$$2- f(x) = \frac{x+1}{(x-1)(x-2)}$$

$$\text{جوابی} \rightarrow \begin{cases} 1 \rightarrow \frac{1+1}{1 \cdot (-1)} = -2 \\ 2 \rightarrow \frac{2+1}{2 \cdot (-2)} = -\frac{3}{4} \\ 0 \rightarrow \frac{0}{(-1)(-2)} = 0 \end{cases}$$

$$\frac{g}{f} = \left\{ \left(2, \frac{1}{-1} \right), \left(1, \frac{0}{-2} \right), \left(2, \frac{0}{-2} \right), \left(0, \frac{1}{-2} \right) \right\}$$

3-

$$f(2x) = \left\{ \left(\frac{1}{2}, 2 \right), \left(\frac{3}{2}, -1 \right), (2, 2), \left(-\frac{1}{2}, 4 \right) \right\}$$

$$f(x^2) = \left\{ (1, 2), (2, 2), (-2, 2), (-1, 2), (\sqrt{2}, -1), (\sqrt{3}, 1) \right\} \rightarrow x^2 = -1 \text{ جواب ندارد}$$

$$g(x) + 1 = \left\{ (-2, 1), (1, 4), (3, 13), (-1, 1) \right\}$$

$$3x(2)^2 + 1 = 13$$

$$3x(-1)^2 + 1 = 4$$

$$3x(2)^2 + 1 = 13$$

$$3x(0)^2 + 1 = 1$$

$$g) \frac{f}{g} = \left\{ (1, 4), (3, -1), \left(-1, \frac{13}{0} \right) \right\}$$

4-

$$2f+g = \left\{ (2, 5), (3, 5), (-2, 4) \right\}$$

$$\omega - \sqrt{3x} - x \geq 0 \rightarrow \sqrt{3x} - x \geq 0 \rightarrow \sqrt{3x} \geq x \rightarrow 3x \geq x^2 \rightarrow 0 \geq x^2 - 3x \rightarrow 0 \geq x(x-3)$$

$$x \in [0, 3], x \neq 1$$

جواب صحیح

$$[x] + [-x] \xrightarrow{\text{بهرصورت}} \frac{f(x)}{g(x)+1} = \left\{ (0, 0), \left(1, \frac{\sqrt{3}-1}{-1} \right), (3, 0) \right\}$$

$$4- \omega x - x^2 - 4 \geq 0 \rightarrow -(x^2 - \omega x + 4) \geq 0 \rightarrow -(x-1)(x-4) \geq 0 \rightarrow x \in [1, 4]$$

$$h(x) = \frac{f(x)}{g(x)} = \left\{ \left(1, \frac{0}{3} \right), \left(2, \frac{\sqrt{2}}{2} \right), \left(4, \frac{0}{2} \right) \right\}$$

٧ -

الف) $4 \in (x^3 - 3x^2 + 3x - 1) + 1 \rightarrow 4 \in (x-1)^3 + 1 \rightarrow 4 - 1 \in (x-1)^3 \rightarrow \sqrt[3]{4-1} \in x-1$
 $\rightarrow x \in \sqrt[3]{4-1} + 1 \rightarrow R_F \in R$

ب) $4 \in \frac{1}{x^2 - 4x} \rightarrow 4x^2 - 4x \in 1 \rightarrow 4x^2 - 4x - 1 \geq 0 \rightarrow \Delta \geq 0 \rightarrow (-24)^2 - 4(4)(-1) \geq 0$
 $\rightarrow 4x^2 + 4x \geq 0 \xrightarrow{+4} 4x^2 + 4x + 1 \geq 0 \rightarrow 4(x+1) \geq 0 \rightarrow \frac{-1 \pm \sqrt{1-4}}{2} \rightarrow R_F \in (-\infty, -1] \cup (0, +\infty)$

٨ -

الف) $\int_{\text{رأس}}^{\infty} \begin{cases} x \in \frac{-b}{4a} \in \frac{F}{4} \in 4 \\ 4 \in (x)^2 - F(x) + 10 \in 4 \end{cases} \rightarrow R_F \in [4, +\infty)$

ب) $\int_{\text{رأس}}^{\infty} \begin{cases} x \in \frac{-9}{-4} \in 12 \\ 4 \in -(x)^2 + 9(x) + 13 \in 12 \end{cases} \rightarrow R_F \in (-\infty, 12]$

ج) $\int_{\text{رأس}}^{\infty} \begin{cases} x \in \frac{F}{4} \in 4 \\ 4 \in F - 1 - 3 \in 0 \end{cases} \xrightarrow{\text{زیر ادبکان}} R_F \in [0, +\infty)$

د) $\int_{\text{رأس}}^{\infty} \begin{cases} x \in \frac{-9}{-4} \in 12 \\ 4 \in -9 + 18 \in 9 \end{cases} \xrightarrow{\text{زیر ادبکان}} R_F \in [0, 12]$

٩ -

الف) $R_F \in R$

ب) $R_F \in R$

ج) $R_F \in [0, +\infty)$

د) $R_F \in R$

١٠ -

الف) $R_F \in R - \{3\}$

ب) $R_F \in R - \{2\}$