

$$f(x) = \left(\frac{1}{x}\right)^{x-1} \quad y = \sqrt{x^x f(x+1)} \quad x^x f(x+1) \geq 0 \quad \rightarrow [0, +\infty)$$

$$\hookrightarrow f(x+1) = \left(\frac{1}{x+1}\right)^{x-1} - 1 \Rightarrow x^x \left(\left(\frac{1}{x+1}\right)^{x-1} - 1\right) \geq 0 \quad \begin{cases} x^x \geq 0 \\ \left(\frac{1}{x+1}\right)^{x-1} \geq 1 \end{cases}$$

$$D_f = \frac{\cdot}{\cdot} \Rightarrow D_f = [0, 1]$$

$$(-\infty, 1] \quad \checkmark$$

$$f(x) = \sqrt{x + |x+1|} \quad D_f(-x) = ? \quad x + |x+1| \geq 0 \quad (5)$$

$$f(-x) = \sqrt{-x + |1-x|} \Rightarrow -x + |1-x| \geq 0 \Rightarrow |1-x| \geq x$$

$$\Rightarrow \begin{cases} 1-x \geq x \Rightarrow 1 \geq 2x \Rightarrow x \leq \frac{1}{2} \checkmark \\ 1-x \leq -x \Rightarrow 1 \leq 0 \quad \text{ممنوع} \end{cases} \quad D_f(-x) = (-\infty, \frac{1}{2}]$$

$$y = \sqrt{\frac{x-1}{f(x)}} \quad \frac{x-1}{f(x)} \geq 0 \quad \begin{cases} f(x) > 0 \Rightarrow (-\infty, -2) \cup (2, 3) \\ x-1 \geq 0 \Rightarrow x \geq 1 \end{cases} \quad (I) \quad \text{عبارات}$$

$$\begin{cases} x-1 \leq 0 \Rightarrow x \leq 1 \\ f(x) < 0 \Rightarrow (-2, 2) \end{cases} \quad (II) \quad \text{عبارات}$$

$$D_y = I \cap II = (-2, 1] \cup (2, 3)$$

$$y_1 = \frac{1}{4x^2 - 5x^2 - 4x - 4} \quad y_2 = \frac{1}{x^2 + ax + b} \quad \sqrt{-(a+b)} = ? \quad (150)$$

$$\hookrightarrow D_{y_1} = \mathbb{R} \Rightarrow D_{y_2} = \mathbb{R}$$

$$x^2 + ax + b \Rightarrow \Delta = a^2 - 4(1)(b) < 0$$

$$x^2 + ax + b \neq 0$$

$$x^2 - x - 4 = x^2 + ax + b$$

$$a = -1, b = -4$$

$$\sqrt{-(a+b)} = 2$$

$$f(x) = x^3 + x \quad y = \sqrt{f(x) - f\left(\frac{r}{x}\right)} \Rightarrow \sqrt{x^3 + x - \frac{r^3}{x^3} - \frac{r}{x}}$$

$$\Rightarrow x^3 + x - \left(\frac{r^3}{x^3} + \frac{r}{x}\right) \geq 0 \quad \frac{x^4 + x^2 - r^3 - rx^2}{x^3} \geq 0$$

$$\Rightarrow \frac{(x^2 - r)(x^2 + 2x^2 + 1r)}{x^3} \geq 0 \quad \text{است} \quad \frac{(x-r)(x+r)}{x^3} \geq 0$$

$$\Rightarrow \begin{array}{c|ccc} x & -r & 0 & r \\ \hline y & - & + & - \end{array} \quad D_f = [-r, 0) \cup [r, +\infty)$$

$$f(x^3 + x) = rx^2 - 1 \quad f(r) + f(1) = ? \xrightarrow{x=r} f\left(\frac{r^3}{r} + r\right) = r(r)^2 - 1 = \sqrt{\quad} \quad (5)$$

$$\xrightarrow{x=1} f\left(\frac{1^3}{1} + 1\right) = r(1)^2 - 1 = 1 \quad f(r) + f(1) = 1 + \sqrt{\quad} = \sqrt{\quad} \quad \text{جواب}$$

$$f(x) = x^3 - 2x^2 + 11x \quad g(x) = x^3 + 9x^2 + 2\sqrt{x} \quad \text{است} \quad (x+r)^3 - 2\sqrt{x} = (\sqrt{x} - r + r)^3 - 2\sqrt{x} = -2\sqrt{x} \quad (V)$$

$$\text{است} \quad (x-r)^3 + 1 = (\sqrt{x} + r - r)^3 + 1 = 1 \quad (5)$$

$$\frac{g(\sqrt{x} - r)}{f(\sqrt{x} + r)} = \frac{-2\sqrt{x}}{1} = -2 \quad \text{جواب}$$

$$f(x) = \sqrt{x + r\sqrt{x-r}} \quad f(x) + g(x) = \sqrt{x + r\sqrt{x-r}} + \sqrt{x - r\sqrt{x-r}} \quad (1)$$

$$g(x) = \sqrt{x - r\sqrt{x-r}} \Rightarrow \sqrt{(x-r) + r\sqrt{x-r} + r} + \sqrt{(x-r) - r\sqrt{x-r} + r}$$

$$= \sqrt{(\sqrt{x-r} - r)^2} + \sqrt{(\sqrt{x-r} + r)^2} = |\sqrt{x-r} - r| + |\sqrt{x-r} + r|$$

$$(\sqrt{x-r} - r) + (\sqrt{x-r} + r) = 0 \quad \text{است} \quad x \geq r$$

$$a + b\sqrt{x+c} = 0 \Rightarrow \sqrt{x+c} = 0 \Rightarrow c = -r$$

$$a = 0 \quad \frac{a+b}{c} = \frac{-1}{r}$$

$$a + b = 0 \quad \frac{a+b}{c} = 0$$

$$f(x) = \frac{x+1}{x^2-1x+1} \Rightarrow \frac{x+1}{(x-1)(x-1)} \quad D_f = \mathbb{R} - \{1, 1\}$$

$$g(x) = \{(1,1)(1,0)(3,5)(\cdot, 1)\} \quad D_g = \{1, 1, 3, \cdot\}$$

$$\frac{g}{f} = \{(0, 3)(2, -\frac{1}{4})\}$$

$$f(x) = \{(1,2)(3,-1)(4,2)(-1,6)\} \quad g(x) = \{(-2,3)(1,-1)(3,2)(-1,0)\}$$

$$\text{الف) } f(1/x) = \{(\frac{1}{1}, 2)(\frac{3}{1}, -1)(\frac{4}{1}, 2)(-\frac{1}{1}, 6)\}$$

$$\text{ب) } f(x^2) = \{\sqrt{1}, 2)(+\sqrt{3}, -1)(-\sqrt{3}, -1)(-2, 2)(2, 2)(\sqrt{-1}, 6)\}$$

$$\text{ج) } 19^2(x)+1 \Rightarrow \text{نفسه: } 19(3)^2+1=19$$

$$\Rightarrow \text{جواب: } \{(-2, 19)(1, 3)(3, 9)(-1, 1)\}$$

$$\text{د) } \frac{f}{g} = \{(1, -4)(3, -1)(-1, \cdot)\}$$