

$$\text{الف) } x \neq 0, x \neq 1, \frac{x-1}{x} - \frac{x}{x-1} \geq 0 \Rightarrow \frac{1-2x}{x^2-x} \geq 0$$

$$\frac{0}{+} - \frac{1}{-} - \frac{1}{+} = \frac{1}{+} \Rightarrow D_f = (-\infty, 0) \cup [\frac{1}{2}, 1)$$

$$\text{ب) } x \neq -1, 0, 1, -2, \frac{x}{x-1} + \frac{1}{x+2} \geq 0 \Rightarrow \frac{\epsilon x + \delta}{x^2 + x - 2} \geq 0 \Rightarrow x \geq -\frac{\delta}{\epsilon}$$

$$\Rightarrow D_f = \mathbb{R} - \left\{ -2, -\frac{\delta}{\epsilon}, 0, 1 \right\}$$

$$\left(\left(\frac{1}{\epsilon} \right)^x - 9 \right) (x^2 - \epsilon^x) \geq 0 \quad x \geq -2, \frac{\delta}{\epsilon}$$

$$\Rightarrow \frac{-2}{+} - \frac{\delta}{+} = \frac{1}{+} \Rightarrow D_f = (-\infty, -2] \cup [\frac{\delta}{\epsilon}, +\infty)$$

$$\text{ب) } x-1 \geq 0 \Rightarrow x \geq 1, \sqrt{y+1} \geq 3 - \sqrt{x-1} \Rightarrow 3 - \sqrt{x-1} \geq 0$$

$$\Rightarrow 3 \geq \sqrt{x-1} \Rightarrow 9 \geq x-1 \Rightarrow 10 \geq x \Rightarrow D_f = [1, 10]$$

$$x^2 - x - 2 > 0 \quad \frac{-1}{+} - \frac{2}{+} \Rightarrow x \in (-\infty, -1) \cup (2, +\infty)$$

$$\text{مخرج همواره مثبت است, } x^2 - 1 \geq 0 \Rightarrow x \in (-\infty, -1] \cup [1, +\infty)$$

$$\Rightarrow D_f = (-\infty, -1) \cup (2, +\infty)$$

$$\text{ج) } \left(\frac{1}{a} \right)^b - 2 \geq 0 \Rightarrow 3 - 2a - \epsilon \geq 0 \Rightarrow a \geq -\frac{1}{\epsilon}$$

$$0 - x^2 - \frac{x}{y} + 3 \geq 0 \Rightarrow x \geq \frac{3}{y}, \quad \text{غیر قابل قبول } (-2)$$

$$\Rightarrow a + b \geq -\frac{1}{\epsilon} + \frac{\epsilon}{\epsilon} \geq \frac{1}{\epsilon}$$

$$f(x) - x \geq 0 \Rightarrow f(x) \geq x \quad \text{if } x \geq 1 \Rightarrow 3x - 2 \geq x \Rightarrow x \geq 1$$

$$\text{if } x < 1 \Rightarrow x \geq -\epsilon, \quad x < 1$$

$$\Rightarrow D_f = [-\epsilon, +\infty)$$

$$u = \sin \frac{\pi}{4} + \cos \frac{\pi}{4} = \frac{\sqrt{2}}{2} + 1 = \frac{\sqrt{2} + 2}{2} \quad -4$$

$$f(u) = 2u(u-1), \quad x\left(\frac{\sqrt{2}+2}{2}\right)\left(\frac{\sqrt{2}-2}{2}\right) = \frac{2-4}{2} = -1$$

$$f(f(a)) = \frac{\left(\frac{a+1}{a-1}\right) + 1}{\left(\frac{a+1}{a-1}\right) - 1} = \frac{\frac{2a}{a-1}}{\frac{2}{a-1}} = \frac{2a}{2} = a \quad a \neq 1 \quad -5$$

$$f(a) = \frac{a+1}{a-1} \quad \frac{\left(\frac{a+1}{a-1}\right) - 1}{\frac{2}{a-1}}$$

$$\Rightarrow a \in \mathbb{R} - \{1\}$$

$$g(a) = t \quad f(t) = -\varepsilon \Rightarrow t - \varepsilon < t < -\varepsilon \Rightarrow t - \varepsilon < t < -\varepsilon = 0 \quad -6$$

$$\Rightarrow t < \varepsilon \Rightarrow g(a) = \varepsilon \Rightarrow \sqrt{a^2 - 1} = \varepsilon \Rightarrow a^2 - 1 = \varepsilon$$

$$\Rightarrow a^2 \geq 0 \Rightarrow \underline{a \geq \pm \sqrt{\delta}}$$

$$u + \varepsilon < \varepsilon \Rightarrow u < 1 \Rightarrow f(u) = 1 - \delta + \varepsilon < \varepsilon \quad -7$$

$$u + \varepsilon < -\varepsilon \Rightarrow u < -\varepsilon \Rightarrow f(-\varepsilon) = \varepsilon + \varepsilon + \varepsilon < \sqrt{\varepsilon}$$

$$\Rightarrow f(\varepsilon) + f(-\varepsilon) < \varepsilon(\sqrt{\varepsilon}) = 1 \varepsilon \varepsilon$$

$$\varepsilon \cos^2 u + \delta \cos u = \frac{\sqrt{\varepsilon}}{2} \Rightarrow 1 \cos^2 u + 1 \cos u - \sqrt{\varepsilon} = 0 \quad -8$$

$$\Rightarrow \cos^2 u + 1 \cos u - \sqrt{\varepsilon} = 0 \Rightarrow u = \frac{\varepsilon}{1}, \quad \left(\frac{1 \varepsilon}{1}\right) \rightarrow \text{غير قابل قبول}$$

$$\Rightarrow \cos u = \frac{1}{2} \Rightarrow u = \frac{\pi}{3} \Rightarrow f\left(\frac{\pi}{3}\right) = \tan^2 \frac{\pi}{3} = 3$$