

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

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

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

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

$$\left(\left(\frac{1}{x}\right)^x - 9\right)(x^2 - 4) \geq 0 \quad x \geq -2, \frac{2}{x}$$

$$\Rightarrow \frac{-2}{+} - \frac{2}{+} \Rightarrow D_f = (-\infty, -2] \cup \left[\frac{2}{x}, +\infty\right)$$

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

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

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

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

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

$$\text{ج)} \quad a \geq -\frac{1}{x}, \quad 3 - 2a - 5 \geq 0 \Rightarrow a \geq -\frac{1}{x}$$

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

$$\Rightarrow a + b \geq -\frac{1}{x} + \frac{3}{x} \Rightarrow \frac{2}{x}$$

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

$$\text{if } x < 1 \Rightarrow x \geq -5, \quad x < 1$$

$$\Rightarrow D_f = [-5, +\infty)$$

Subject:

Date:

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

$$f(u) = r u (u-r), \quad x\left(\frac{\sqrt{r}+r}{r}\right)\left(\frac{\sqrt{r}-r}{r}\right) = \frac{r-r^2}{r} = -\frac{1}{r} \quad \text{✓} \quad \text{Ⓢ}$$

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

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

$$\Rightarrow a \in \mathbb{R} - \{1\} \quad \text{✓} \quad \text{Ⓢ}$$

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

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

$$\Rightarrow a^2 \geq 0 \Rightarrow \underline{a \in [-\sqrt{r}, \sqrt{r}]} \quad \text{✓} \quad \text{Ⓢ}$$

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

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

$$\Rightarrow f(r) + f(-r) = r(\sqrt{r}) \quad \text{✓} \quad \text{Ⓢ}$$

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

$$\Rightarrow \cos^2 u + \cos u - \frac{\sqrt{r}}{\Lambda} = 0 \Rightarrow u = \frac{\varepsilon}{\Lambda}, \quad \left(\frac{-1 \pm \sqrt{1 + 4\frac{\sqrt{r}}{\Lambda}}}{2}\right) \quad \text{غير قابل قبول} \quad \text{Ⓢ}$$

$$\Rightarrow \cos u = \frac{1}{r} \Rightarrow u = \frac{\pi}{2} \Rightarrow f\left(\frac{\pi}{2}\right) = \tan^{-1} \frac{\frac{\pi}{2}}{r} = \frac{\pi}{r} \quad \text{✓}$$