

الف) $\left| \frac{x-1}{x} - \frac{x}{x-1} \right| = \sqrt{\frac{x^2 - x + 1 - x^2}{x^2 - x}} = \sqrt{\frac{-x+1}{x(x-1)}} \rightarrow \frac{0}{+||-||+||-} \rightarrow (-\infty, 0) \cup [1, +\infty)$ (1)

ب) $\frac{1}{x+1} - \frac{x}{x-1} \rightarrow DA = \mathbb{R} - \{1, -1\}$ (2)

الف) $\frac{1}{x} - 1 = 0 \rightarrow x = -1$ $\frac{-x}{x^2 - x} = 0 \rightarrow x = 0$ $DA = (-\infty, -1) \cup (0, +\infty)$ (3)

ب) $\sqrt{x-1} \rightarrow x > 1$ $\sqrt{y+1} \Rightarrow \sqrt{x-1} = y \rightarrow x = y^2 + 1 \rightarrow DA = (1, +\infty)$

$x^2 - x - 2 > 0 \rightarrow \frac{-1 \pm \sqrt{1+8}}{2} = \frac{-1 \pm 3}{2} \Rightarrow x = -1, 2$
 $x^2 - 1 \geq 0 \rightarrow \frac{-1 \pm \sqrt{1+4}}{2} = \frac{-1 \pm \sqrt{5}}{2}$
 $\sqrt{x^2 - 1} \neq 0 \Rightarrow \sqrt{x^2 - 1} \neq -1$
 $DA = (-\infty, -1) \cup (2, +\infty)$ (1, 5, 8)
 دقت: $(2, +\infty) \cap [1, +\infty) = (2, +\infty)$

$-(-2)^2 + a(-2) + b = 0 \rightarrow -4a = 1 \rightarrow a = -\frac{1}{4} \Rightarrow p = \frac{c}{a} \rightarrow -x = -\frac{1}{4}x + b \rightarrow b = \frac{3}{4}$ (4)

$a + b = \frac{3}{4} - \frac{1}{4} = \frac{1}{2}$ (5)

$f(x) - x \geq 0 \rightarrow f(x) \geq x$
 $\begin{cases} x \geq 1 \rightarrow x^2 - 2 \geq x \rightarrow x \geq 1 \\ x < 1 \rightarrow x^2 + 2 \geq x \rightarrow x \geq -1 \Rightarrow -1 \leq x < 1 \end{cases} \Rightarrow x \geq -1 \rightarrow DA = [-1, +\infty)$ (6)

$f(\frac{\sqrt{x^2+1}}{2}) = 2(\frac{\sqrt{x^2+1}}{2})^2 - 2(\frac{\sqrt{x^2+1}}{2}) = \frac{1+x\sqrt{x^2+1}}{2} - 2 - 2\sqrt{x^2+1} = \frac{1+x\sqrt{x^2+1} - 4 - 4\sqrt{x^2+1}}{2} = -\frac{1}{2}$ (7)

$f(f(a)) = \frac{a+1}{a-1} + 1 = \frac{a+1+a-1}{a-1} = \frac{2a}{a-1} = a \rightarrow a = a$ (8)

$f(g(a)) = (\sqrt{a^2+1})^2 - 2\sqrt{a^2+1} = -2 \xrightarrow{\sqrt{a^2+1}=t} t^2 - 2t + 2 = 0 \rightarrow t = 1 \rightarrow \sqrt{a^2+1} = 1$ (9)

$a^2 = 0 \rightarrow a = \pm \sqrt{0}$ (10)

$u^2 = t \xrightarrow{t=1} u=1 \rightarrow f(1) = 1 - 2 + 2 = 1$
 $t=4 \rightarrow u=2 \rightarrow f(2) = 2^2 - 2 + 2 = 4$
 $f(f(1)) = f(1) = 1$ (11)

$\epsilon \cos^2 x + \delta \cos x = 1/2 \xrightarrow{x=\pi/4} \frac{\epsilon}{2} + \frac{\delta}{2} = 1/2 \rightarrow \cos x = \frac{1}{2} \Rightarrow \sin x = \frac{\sqrt{3}}{2}$ (12)

$\tan^2 \frac{\pi}{4} = \left(\frac{\sqrt{3}}{1} \right)^2 = 3$ (13)

$$3- \log_{\epsilon} u^2 - u - 2 \rightarrow u^2 - u - 2 > 0 \rightarrow (u-2)(u+1) > 0 \quad \frac{-1 \pm 2}{+1 -1 +1} \rightarrow u > 2 \leq u < -1 \quad I$$

$$\sqrt{u^2 - 1} + 1 \rightarrow \text{هواره مثبت است} \rightarrow \sqrt{u^2 - 1} \rightarrow u^2 - 1 > 0 \rightarrow u \geq 1 \leq u \leq -1 \quad II$$

$$I, II \rightarrow u < -1, u > 2 \rightarrow D_f = (-\infty, -1) \cup (2, +\infty)$$