

$$f(x) = \frac{\frac{1}{x+1} - \frac{2}{x}}{\frac{3}{x-1} + \frac{1}{x+2}}$$

$$x+1 \neq 0 \rightarrow x \neq -1$$

$$x-1 \neq 0 \rightarrow x \neq 1$$

$$x+2 \neq 0 \rightarrow x \neq -2$$

$$\frac{3}{x-1} + \frac{1}{x+2} \neq 0 \rightarrow \frac{3(x+2) + (x-1)}{(x-1)(x+2)} \neq 0 \rightarrow x \neq -\frac{5}{4}$$

$$\frac{\sqrt{x^2 - 2x + 1 - x^2}}{x(x-1)}$$

$$\sqrt{\frac{-2x+1}{x(x-1)}} = \frac{0 - \frac{1}{2} - 1}{\frac{1}{2} - \frac{1}{2} + \frac{1}{2}} = 1$$

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

$$\sqrt{x-1} + \sqrt{y+1} = 3$$

$$\sqrt{y+1} = 3 - \sqrt{x-1}$$

$$y+1 = 9 + x - 1 - 6\sqrt{x-1}$$

$$y = 8 + \sqrt{x-1} - 6\sqrt{x-1} \rightarrow x \geq 1$$

$$\sqrt{y+1} \geq 0 \rightarrow 3 - \sqrt{x-1} \geq 0 \rightarrow \sqrt{x-1} \leq 3 \rightarrow x-1 \leq 9 \rightarrow x \leq 10$$

$$Df = [1, 10]$$

$$\sqrt{(x^2 - 9)(3x - 2x^2)} \geq 0$$

$$Df = (-\infty, -2] \cup [2, +\infty)$$

$$F(x) = \frac{\log_e (x^2 - x - 2)}{\sqrt{x^2 - 1} + 1}$$

$$x^2 - x - 2 > 0 \rightarrow \frac{-1 \pm 3}{2} \rightarrow x < -1 \text{ or } x > 2$$

$$x^2 - 1 \geq 0 \rightarrow x \leq -1 \text{ or } x \geq 1$$

$$\sqrt{x^2 - 1} \geq 0 \rightarrow \sqrt{x^2 - 1} + 1 \geq 1$$

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

$$f(x) = \sqrt{3 + ax - x^2} \rightarrow -x^2 + ax + 3 \geq 0 \rightarrow \frac{-a \pm \sqrt{a^2 - 12}}{2} \rightarrow Df = [-2, 6]$$

$$-(-2)^2 - 2a + 3 = 0 \rightarrow -2a - 1 = 0 \rightarrow a = -\frac{1}{2} \rightarrow -x^2 - \frac{x}{2} + 3 = (x+2)(-x+\frac{3}{2})$$

$$x = -2 \text{ or } x = \frac{3}{2}$$

$$a + b = -\frac{1}{2} + \frac{3}{2} = 1$$

$$f(x) = \begin{cases} 3x - 2 & x \geq 1 \\ 2x + 3 & x < 1 \end{cases} \rightarrow f(x) - x = \begin{cases} 2x - 2 & x \geq 1 \\ x + 3 & x < 1 \end{cases}$$

$$f(x) - x \geq 0 \xrightarrow{x \geq 1} 2x - 2 \geq 0 \rightarrow x \geq 1$$

$$\xrightarrow{x < 1} x + 3 \geq 0 \rightarrow x \geq -3$$

$$Df = [-3, +\infty)$$

$$f(m) = 2m^{\sqrt{2}} - \varepsilon m = 2m(m - \sqrt{2})$$

$$f\left(\frac{\sin \frac{\pi}{\sqrt{2}} + \cos \frac{\pi}{\sqrt{2}}}{\frac{\sqrt{2}}{2}}\right) = \dots \rightarrow f\left(\frac{2 + \sqrt{2}}{2}\right) \rightarrow \frac{2 \times \frac{2 + \sqrt{2}}{2} \left(\frac{2 + \sqrt{2}}{2} - \sqrt{2}\right)}{\left(\frac{2 + \sqrt{2}}{2}\right) \left(\frac{\sqrt{2} - 2}{2}\right)} = \frac{2 - \sqrt{2}}{2} = -\frac{1}{\sqrt{2}}$$

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

$$f(f(a)) = a$$

$$a - 1 \neq 0 \rightarrow a \neq 1$$

$$\frac{a+1}{a-1} - 1 \neq 0 \rightarrow \frac{2}{a-1} \neq 0$$

$$Da = \{1, 2\}$$

$$f(a) = a^{\sqrt{2}} - \varepsilon m$$

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

$$f(g(a)) = -\varepsilon \rightarrow g(a)^{\sqrt{2}} - \varepsilon g(a) = -\varepsilon \rightarrow g(a)^{\sqrt{2}} - \varepsilon g(a) + \varepsilon = 0$$

$$(g(a) - \sqrt{2})^{\sqrt{2}} = 0 \rightarrow g(a) = \sqrt{2} \quad \begin{matrix} \sqrt{a^{\sqrt{2}} - 1} = \sqrt{2} \\ a = \pm \sqrt{2} \end{matrix}$$

$$f(x+y) = x^{\sqrt{2}} - \varepsilon x + y$$

$$\xrightarrow{x=1} f(\varepsilon) = 1 - \varepsilon + \varepsilon = 1$$

$$\xrightarrow{x=-\sqrt{2}} f(-\sqrt{2}) = (-\sqrt{2})^{\sqrt{2}} - \varepsilon(-\sqrt{2}) + \varepsilon = \sqrt{2}$$

$$\left. \begin{matrix} f(\varepsilon) = 1 \\ f(-\sqrt{2}) = \sqrt{2} \end{matrix} \right\} \rightarrow f(\varepsilon) \times f(-\sqrt{2}) = \sqrt{2} \times 1 = \sqrt{2}$$

$$f(\varepsilon \cos^{\sqrt{2}} x + \omega \cos x) = f(x)^{\sqrt{2}} x, \quad f(\sqrt{2}/\omega) = ?$$

$$\varepsilon \cos^{\sqrt{2}} x + \omega \cos x = \sqrt{2}/\omega \rightarrow \varepsilon \cos^{\sqrt{2}} x + \omega \cos x - \sqrt{2}/\omega = 0$$

$$\cos^{\sqrt{2}} x + \omega \cos x - \sqrt{2}/\varepsilon = 0 \rightarrow (\cos x + \sqrt{2}) (\cos x - \sqrt{2}) = 0$$

$$\cos x = \frac{1}{\sqrt{2}} \quad \text{or} \quad \cos x = -\frac{1}{\sqrt{2}}$$

$$f(\sqrt{2}/\omega) = f(x)^{\sqrt{2}} x = \frac{1}{\cos^{\sqrt{2}} x} - 1 = \frac{1}{\frac{1}{\sqrt{2}}} - 1 = \sqrt{2} - 1 = \sqrt{2}$$

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

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

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