

① الف) $f(x) = \sqrt{\frac{x-1}{x} - \frac{x}{x-1}} = \sqrt{\frac{(x-1)^2 - x^2}{x(x-1)}} \rightarrow \frac{+}{-} \frac{+}{-} \frac{+}{-}$ $D_f: (-\infty, 0) \cup [\frac{1}{2}, \infty)$ B $\frac{1}{2}$ $\frac{1}{x}$ 1

ب) $f(x) = \frac{\frac{1}{x+1} - \frac{x}{x-1}}{\frac{x}{x-1} + \frac{1}{x+1}}$ $I) x \neq -1, 0, 1, -x$ $II) \frac{x - 2x - 2}{(x+1)(x-1)} = \frac{(x+2)(x-2)}{(x+1)(x-1)} = \frac{(x+2)(x-2)}{(x+1)(x-1)}$ $D_f = \mathbb{R} - \{-1, 0, 1, -x, -\frac{x}{2}\}$

ج) الف) $f(x) = \sqrt{((\frac{1}{x})^x - 4)(x^2 - 4x)} \rightarrow \frac{+}{-} \frac{+}{-} \frac{+}{-}$ $D_f: (-\infty, -2], [2, \infty)$

ب) $\sqrt[4]{x-1} - \sqrt{y+1} = 2$ $1) x \geq 1, y \geq -1$ $2) \frac{4}{x-1} \rightarrow (y+1)^2 = 11 - x + 1 \rightarrow 12 - x \geq 0$ $D_f: [1, 12]$

د) $f(x) = \frac{\log(x^2 - x - 2)}{\sqrt{x^2 - 1} + 1} \rightarrow I) x^2 - x - 2 > 0$ $\frac{+}{-} \frac{+}{-} \frac{+}{-}$ $II) x^2 - 1 \geq 0$ $\frac{+}{-} \frac{+}{-} \frac{+}{-}$ $III) \sqrt{x^2 - 1} + 1 \neq 0 \rightarrow \sqrt{x^2 - 1} \neq -1$ $\frac{+}{-} \frac{+}{-} \frac{+}{-}$ $I \cap II \cap III \rightarrow (-\infty, -1) \cup (2, \infty)$

هـ) $f(x) = \sqrt{-x^2 + ax + 3}$ $\rightarrow$ $\frac{+}{-} \frac{+}{-} \frac{+}{-}$ $D_f: [-2, b]$ $x = -2, y = 0 \rightarrow -4 - 2a + 3 = 0$ $-2a = 1, a = -\frac{1}{2}$ $-3 = \frac{a}{b} \rightarrow -3 = -2a b \rightarrow b = 1, b, a = -\frac{1}{2}, -0.5$ $f(x) = \sqrt{-x^2 - \frac{1}{2}x + 3}$ $-3 = \frac{a}{b} \rightarrow -3 = -2a b \rightarrow b = 1, b, a = -\frac{1}{2}, -0.5$

و) $g(x) = \sqrt{f(x) - x}, f(x) = \frac{x^2 - 2}{x + 3}$ $x \geq 1, x < 1, f(x) - x \geq 0 \rightarrow \frac{x^2 - 2}{x + 3} - x \geq 0$ $D_f: [-3, \infty)$

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

$$\textcircled{7} \quad \varphi\left(\frac{a+1}{a-1}\right) = \frac{\frac{a+1}{a-1} + 1}{\frac{a+1}{a-1} - 1} = \frac{\frac{a+1+a-1}{a-1}}{\frac{a+1-a+1}{a-1}} = \frac{2a}{2} = a$$

به ازای هر مقدار
داده شده $a \neq 1$ چون
مخرج را تعریف نشده می باشد

$$\textcircled{8} \quad \varphi(u) = u^2 - 2u \quad g(u) = \sqrt{u^2 - 1} \quad \varphi(g(u)) = -2 \quad \varphi(\square) = -2$$

$$u^2 - 2u + 2 = 0 \rightarrow \square = 2 \rightarrow g(u) = 2 \rightarrow u^2 - 1 = 2 \rightarrow u^2 = 3 \rightarrow u = \pm\sqrt{3}$$

$$\textcircled{9} \quad \varphi\left(\frac{-v}{-u+w}\right) = wu + v0 + u = vr \quad \varphi\left(\frac{-v}{1+w}\right) = 1 - 0 + u = r$$

$$\varphi(-v) \times \varphi(r) = vr \times r = 122$$

$$\textcircled{10} \quad \varphi(2\cos^2 + 3\cos) = \tan^2 \rightarrow 2\cos^2 + 3\cos = \frac{1}{2} \rightarrow 2\cos^2 + 3\cos - \frac{1}{2} = 0$$

$$4t^2 + 6t - 1 = 0 \quad (t+2)(t-1) = 0 \rightarrow \begin{cases} t = -2 \rightarrow \cos u = -\frac{1}{2} \\ t = 1 \rightarrow \cos u = \frac{1}{2} \end{cases}$$

یعنی از ۱- بزرگتر است و از ۰ کمتر

$$\cos u = \frac{1}{2} \quad \sin u = \frac{\sqrt{3}}{2}$$

$$\tan u = \frac{\sin}{\cos} \rightarrow \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3} \rightarrow \tan^2 = 3$$