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الف) $f(x) = \sqrt{\frac{x-1}{x} - \frac{x}{x-1}}$ $\frac{x-1}{x} - \frac{x}{x-1} \geq 0 \rightarrow \frac{(x-1)^2 - x^2}{x(x-1)} = \frac{-2x+1}{x^2-x} \geq 0$ $x=1$
 $x=0$
 $x=1$

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

ب) $f(x) = \frac{1}{x+1} - \frac{1}{x} = \frac{x-1-x}{x^2+x} = \frac{-x-1}{x^2+x}$ $I: x^2+x \neq 0 \rightarrow x(x+1) \neq 0$
 $D_{f(x)} = \mathbb{R} - \{ -\frac{1}{2}, -1, 0, 1 \}$ $II: \frac{f(x+a)}{x^2+x-1} \neq 0 \rightarrow f(x+a) \neq 0$
 $x=1$ $x=-1$ $x=0$ $x=-\frac{1}{2}$

الف) $F(x) = \sqrt{\left[\left(\frac{1}{x}\right)^x - 9\right] \left[14 - x^x\right] \left[\left(\frac{1}{x}\right)^x - 9\right] (14 - x^x)} \geq 0 \rightarrow x \mid - \frac{1}{2} + \frac{1}{2} - \frac{1}{2} +$ $\frac{1}{x} = 9 \rightarrow x = -\frac{1}{9}$ $x^x = 9 \rightarrow x = 9$ $D_f = (-\infty, -\frac{1}{9}] \cup [\frac{1}{9}, +\infty)$

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

ب-2) $\sqrt{x-1} + \sqrt{y+1} = 3$ $\sqrt{y+1} = 3 - \sqrt{x-1} \rightarrow \sqrt{y+1} \geq 0 \rightarrow 3 - \sqrt{x-1} \geq 0 \rightarrow \sqrt{x-1} \leq 3 \rightarrow x-1 \leq 9 \rightarrow x \leq 10$

$x-1 \geq 0 \rightarrow x \geq 1$ $I, II \rightarrow 1 \leq x \leq 10 \rightarrow D_f = [1, 10]$

$F(x) = \frac{(x^2-x-2)}{\log x}$ $I: x^2-x-2 > 0 \rightarrow x < -1 \text{ or } x > 2$ $II: \sqrt{x^2-1} + 1 \neq 0 \rightarrow \sqrt{x^2-1} \neq -1 \rightarrow \mathbb{R}$
 $III: x^2-x-2 > 0 \rightarrow x < -1 \text{ or } x > 2$ $D_f = (-\infty, -1] \cup [2, +\infty) \cap \mathbb{R} \cap (-\infty, -1] \cup [2, +\infty) = (-\infty, -1] \cup [2, +\infty)$

عبارت صوری نتایج باید مثبت باشد!

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

$g(x) = \sqrt{F(x)-x} \rightarrow x > 1 \quad g(x) = \sqrt{1-x-x} \rightarrow g(x) = \sqrt{1-2x} \quad x > 1$
 $\rightarrow x < 1 \quad g(x) = \sqrt{1+x-x} \rightarrow g(x) = \sqrt{1} = 1 \quad x < 1$ $D_g? \quad 1$

$$F(x) = x^r - x$$

$$F\left(\sin \frac{\pi}{4} + \cos \frac{\pi}{4}\right) = F\left(\frac{\sqrt{2}}{2} + 1\right) = r\left(\frac{\sqrt{2}}{2} + 1\right)^r - r\left(\frac{\sqrt{2}}{2} + 1\right) = r\left(\frac{r}{2} + \sqrt{2} + 1\right) - r\left(\frac{\sqrt{2}}{2} + 1\right)$$

$$\frac{r}{2} + r\sqrt{2} + r - r\sqrt{2} - r = \frac{r}{2} - r = -\frac{r}{2}$$

✓

$$F(x) = \frac{x+1}{x-1} \quad F(F(a)) = a \rightarrow F\left(\frac{a+1}{a-1}\right) = \frac{\frac{a+1}{a-1} + 1}{\frac{a+1}{a-1} - 1} = \frac{r_a}{r} = a$$

$$a \in \mathbb{R} \setminus \{1\}$$

✓

$$f(x) = x^r - x \quad f(x) = -x \rightarrow x^r - x = -x \rightarrow x^r - x + x = 0 \rightarrow (x-1)^r = 0 \rightarrow x=1$$

$$g(x) = \sqrt{x^r - 1} \quad g(a) = r \rightarrow \sqrt{a^r - 1} = r \rightarrow a^r - 1 = r^2 \rightarrow a^r = r^2 + 1 \rightarrow a = \pm \sqrt[r]{r^2 + 1}$$

$$F(g(a)) = -x$$

$$a = \pm \sqrt[r]{r^2 + 1}$$

✓

$$F(x+y) = x^r - \omega x + y \quad F(x) \times F(y) = x^r \times y^r = x^r y^r$$

$$x+y = 1 \rightarrow x=1$$

$$F(1) = 1 - \omega + y = r$$

$$x+y = -r \rightarrow x = -r$$

$$F(-r) = r^r + r^0 + y = r^r$$

✓

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$$F(\cos^r x + \omega \cos x) = \tan^r x$$

$$C \cdot \sin = \frac{-a \pm \sqrt{b^2 + 4ac}}{2a} \rightarrow C \cdot \sin = \frac{-a+9}{1} = \frac{1}{r} \rightarrow \tan^r x + 1 = \frac{1}{r} \rightarrow \tan^r x = \frac{1}{r} - 1$$

$$C \cdot \sin = \frac{-a-9}{2a} = -\frac{r}{2} x$$

$$\cos^r x + \omega \cos x = \frac{r^0}{10} \rightarrow \cos^r x + \omega \cos x - \frac{r}{10} = 0 \rightarrow D = b^2 - 4ac \rightarrow r^2 - (r^2 \cdot r^2 - \frac{r}{10}) = 9 \rightarrow x = \frac{-b \pm \sqrt{D}}{2a} \rightarrow \frac{-a+4}{1}$$

$$\cos x = -1 \rightarrow F(r^0) = 1 - 1 = 0$$

$$\cos x = -\frac{1}{r} \rightarrow F(r^0) = \tan^r x \rightarrow \tan^r x = \frac{1}{\cos^r x} - 1 \rightarrow \tan^r x = \frac{1}{\frac{1}{r^r}} - 1 \rightarrow \tan^r x = r^r - 1$$

$$\cos^r x = \frac{1}{r^r}$$

$$3- \log_e \frac{x^2-n-2}{x} \rightarrow x^2-n-2 > 0 \rightarrow (n-2)(n+1) > 0 \rightarrow \frac{-1 \pm 2}{+2-2+} \rightarrow n > 2 \leq n < -1 \quad I$$

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

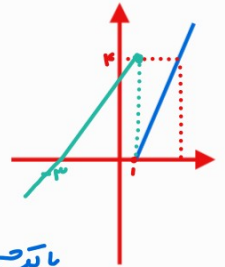
$$I, II \rightarrow x < -1, n > 2 \rightarrow Df = (-\infty, -1) \cup (2, +\infty)$$

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

$$f(n) - n \geq 0 \rightarrow \begin{cases} x_n - 2 \geq 0 \rightarrow n \geq 1 \checkmark \\ n + 3 \geq 0 \rightarrow -3 \leq n < 1 \checkmark \end{cases}$$

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

بالتوجه به شکل نیز مشخص است!



$$f(x \cdot \sin n + a \cdot \cos n) = f(3, 0) \rightarrow x \cdot \sin n + a \cdot \cos n = 3, a \rightarrow x \cdot \sin n + a \cdot \cos n - \frac{3}{x} = 0 \quad -10$$

$$C \cdot \sin n = \frac{-a \pm \sqrt{a^2 + a^4}}{a} \rightarrow C \sin n = \frac{-a + 9}{a} = \frac{1}{x}$$

$$\hookrightarrow C \cdot \sin n = \frac{-a - 9}{a} = -\frac{3}{x} \times C \cdot \sin n = -$$

$$\text{ملاحظه: } C \cdot \sin \frac{\pi}{2} = \frac{1}{x}, \quad C \cdot \sin \frac{3\pi}{2} = \frac{1}{x} \rightarrow f(3, 0) = 3$$

$$\downarrow$$

$$\cos n = (\sqrt{3})^2 = 3$$

$$\downarrow$$

$$\cos n = (-\sqrt{3})^2 = 3$$