۱۹,۲۵

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

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

x	0	$\frac{1}{2}$	1
y	$+$ ∄ $-$	0	$+$ ∄ $-$

$\rightarrow D_f = (-\infty, 0) \cup [\frac{1}{2}, 1)$ ✓

ب) $\frac{\frac{1}{x+1} - \frac{2}{x}}{\frac{3}{x-1} + \frac{1}{x+2}} = \frac{\frac{-2x-2}{x(x+1)}}{\frac{3x+6+x-1}{(x-1)(x+2)}}$ (۲)

۱) $(x-1)(x+2) \neq 0 \rightarrow x \neq 1, -2$

۲) $4x+5 \neq 0 \rightarrow x \neq -\frac{5}{4}$

۳) $x(x+1) \neq 0 \rightarrow x \neq 0, -1$

$\Rightarrow D_f = \mathbb{R} - \{-2, -\frac{5}{4}, -1, 0, 1\}$ ✓

$\left(\left(\frac{1}{3}\right)^{x-9}\right)\left(32-4^x\right) \geq 0$ (۲)

-2 ، $\frac{5}{2}$

x	-2	$\frac{5}{2}$
y	$+$ ∅ $-$	∅ $+$

$D_f = (-\infty, -2] \cup [\frac{5}{2}, +\infty)$ ✓

$\sqrt{x-1} + \sqrt{y+1} = 3$ (۲)

۱) $x-1 \geq 0 \rightarrow \boxed{x \geq 1}$

۲) $\sqrt{x-1} \leq 3 \rightarrow x-1 \leq 11 \rightarrow \boxed{x \leq 12}$

$\Rightarrow D_f = [1, 12]$ ✓

$\frac{\log_4^{(x^2-x-2)}}{\sqrt{x^2-1}+1}$ (۲)

$x^2-1 \geq 0$

$x^2 \geq 1 \Rightarrow \begin{matrix} x \geq 1 \\ x \leq -1 \end{matrix}$

$x^2-x-2 > 0$

$(x-2)(x+1) > 0 \rightarrow (-\infty, -1) \cup (2, +\infty)$

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

$\sqrt{3+ax-x^2} \rightarrow D_f = [-2, b]$ (۲)

$x=-2 \rightarrow y=0$

$\xrightarrow{x=-2} 3-2a-4=0$

$-2a-1=0$

$-2a=1 \rightarrow \boxed{a=-\frac{1}{2}}$ ✓

$\sqrt{3-\frac{1}{2}x-x^2}$

$3-\frac{1}{2}x-x^2 \geq 0$

$-2x^2-x+6 \geq 0 \xrightarrow{\times(-1)} x^2-x-12 \leq 0$

$(x-4)(x+3) \leq 0$

$x=4$ ، $x=-3$

$D_f = [-2, \frac{3}{2}]$

$\Rightarrow a+b = -\frac{1}{2}-\frac{3}{2} = 1$ ✓ (یا سنج)

$g(x) = \sqrt{f(x)-x}$ (۲)

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

$D_f = [-3, +\infty)$ ✓

$x \geq 1 \rightarrow g(x) = \sqrt{3x-2-x} = \sqrt{2x-2} \rightarrow 2x-2 \geq 0 \rightarrow \boxed{x \geq 1}$

$x < 1 \rightarrow g(x) = \sqrt{2x+3-x} = \sqrt{x+3} \rightarrow x+3 \geq 0 \rightarrow \boxed{x \geq -3} \Rightarrow \boxed{-3 \leq x < 1}$

$2f(3) = f(-2) + a$

$2f(3) = 2a - 4 + a = 3a - 4$

$f(3) = 2a - 2$

$\Rightarrow 2a - 2 = 7a + 7$

$5a = -9$

$a = -\frac{9}{5}$ ✓

(۲)

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

$\sqrt{2+\sqrt{3}} = u \quad \sqrt{2-\sqrt{3}} = v \Rightarrow uv = 1$

$v = \frac{1}{u}$

$f(u) = u + \frac{1}{u} + 2$

$f(v) = v + \frac{1}{v} + 2 = \frac{1}{u} + u + 2$

$f(u) + f(v) = 2\left(\frac{1}{u} + u + 2\right) = 2\left(u + \frac{1}{u}\right) + 4 \Rightarrow 2\left(\sqrt{2+\sqrt{3}} + \sqrt{2-\sqrt{3}}\right) + 4$

$\sqrt{4} \rightarrow 2\sqrt{4} + 4$

(۱,۲۵)

$x \rightarrow 2f(x) - 3f(-x) = 4x^2 - x \xrightarrow{\times 2} 4f(x) - 6f(-x) = 8x^2 - 2x$

$-x \rightarrow 2f(-x) - 3f(x) = 4x^2 - x \xrightarrow{\times 3} 6f(-x) - 9f(x) = 12x^2 + 3x$

$-5f(x) = 20x^2 + x$

$f(x) = \frac{20x^2 + x}{-5}$

$f(x) = -4x^2 - \frac{x}{5}$ ✓

(۲)

$x=0 \rightarrow 2f(0) = 3m - 1$

$x=-2 \rightarrow 6f(0) = 12 + 3m + 3m - 1$

$\Rightarrow \begin{cases} 2f(0) = 3m - 1 \\ 6f(0) = 11 + 6m \end{cases}$

$12 + 6m - 1 = 11 + 6m$

روش ترکیبی: $4f(0) = 12 + 2m \rightarrow f(0) = 4 + \frac{m}{2}$

روش ترکیبی: $8f(0) = 8m + 16 \rightarrow f(0) = m + \frac{16}{8}$

$\Rightarrow 4 + \frac{m}{2} = m + \frac{7}{4} \rightarrow 8 + m = 2m + \frac{7}{2}$

$m = \frac{9}{2}$ ✓

$f(0) = 4 + \frac{9}{4} = \frac{25}{4}$

(۲)

$ax + b + a\left(\frac{1}{x}\right) + b = ax + \frac{a}{x} + 2b$

$f(x) + f\left(\frac{1}{x}\right) = \frac{3x^2}{x} - \frac{12x}{x} + \frac{3}{x} = 3x - 12 + \frac{3}{x}$

$ax + \frac{a}{x} + 2b = 3x + \frac{3}{x} - 12$

$\Rightarrow a = 3$ ، $b = -6$

$f(x) = ax + b = 3x - 6$

$f(-1) = 3(-1) - 6 = -9$ ✓

(۲)