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Q. 300

$$f(a) = \begin{cases} x_r + a & x_r \geq a \\ x_r + a + 1 & x_r < a \end{cases} \Rightarrow \begin{cases} x_r & x_r \geq a \\ x_r + 1 & x_r < a \end{cases}$$

$$2) \cot^{-1} \frac{1}{\sqrt{5}} + \tan^{-1} \frac{1}{\sqrt{5}} = \frac{1}{4} \pi \text{ and } 1 - \frac{1}{\sqrt{5}} + \frac{1}{\sqrt{5}} + 0 = 1$$

⑦

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$$\text{الف) } y = \sqrt{x^2 - 1} + \sqrt{x - 2} \quad (4)$$

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

$$a \begin{cases} x \leq -1 \\ x \geq 1 \end{cases} \quad (1) \quad (1, 2) \Rightarrow x \geq 2 \quad [2, +\infty)$$

$$\sqrt{x - 2} \geq 0 \rightarrow x - 2 \geq 0 \rightarrow x \geq 2 \quad (2)$$

$$\text{ب) } y = \frac{\sqrt{4 - 2x}}{\sqrt{4x - 2}}$$

$$\sqrt{4 - 2x} \geq 0 \rightarrow 4 - 2x \geq 0 \rightarrow 4 \geq 2x \rightarrow 2 \geq x$$

$$\sqrt{4x - 2} \geq 0 \rightarrow 4x - 2 \geq 0 \rightarrow 4x \geq 2 \rightarrow x \geq \frac{1}{2}$$

$$\frac{1}{2} \leq x \leq 2 \quad \left(\frac{1}{2}, 2\right]$$

$$y = \sqrt{4x - a} + \sqrt{b - 2x} \quad (1)$$

$$4x - a \geq 0 \Rightarrow x \geq \frac{a}{4}$$

$$b - 2x \geq 0 \Rightarrow x \leq \frac{b}{2}$$

$$D = \left[\frac{a}{4}, \frac{b}{2}\right] \Rightarrow \frac{a}{4} = \frac{b}{2} = 1$$

$$\Rightarrow b = 4, a = 2 \Rightarrow \frac{b}{a} = \frac{4}{2} = 2$$

$$f(x) = \begin{cases} 2x^2 - b & |x+1| \geq 2 \\ a + 2x & -2 \leq x \leq -1 \end{cases} \quad (2)$$

$$|x+1| \geq 2 \rightarrow x+1 \geq 2 \rightarrow x \geq 1$$

$$x+1 \leq -2 \rightarrow x \leq -3$$

$$f(-2) = 2(-2)^2 - b = a + 2(-2) \Rightarrow 8 - b = a - 4 \Rightarrow 12 = a + b$$

$$\Rightarrow 12 = a + b$$

$$\text{الف) } y = \frac{1}{x^3 - 2x^2} = \frac{1}{x^2(x-2)} \quad (3)$$

$$x^2(x-2) \neq 0 \rightarrow x^2(x-2) = 0 \Rightarrow$$

$$\rightarrow x^2 = 0 \rightarrow x = 0$$

$$\rightarrow x - 2 = 0 \rightarrow x = 2$$

$$\text{ب) } y = \frac{1}{2x^3 + 3x^2 + 2x + 1} \quad D = \mathbb{R} - \{-1\}$$

$$2x^3 + 3x^2 + 2x + 1 \neq 0 \rightarrow 2x^3 + 3x^2 + 2x + 1 = 0$$

$$\Rightarrow 2x^2(2x+1) + 1(2x+1) = 0 \Rightarrow$$

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

$$u) y = \sqrt{\frac{x^2 - 2x^2 - 2x + 4}{x^2 + 2x^2 - 2x - 4}}$$

$$x^2 - 2x^2 - 2x + 4 > 0 \rightarrow (x-1)(x-2)(x+2) > 0$$

$$x^2 + 2x^2 - 2x - 4 > 0 \rightarrow (x-2)(x+1)(x+2) > 0$$

	-3	-2	-1	1	2	3
$x^2 - 2x^2 - 2x + 4$	-	-	+	+	-	+
$x^2 + 2x^2 - 2x - 4$	-	+	+	-	+	+
y	+	+	+	+	-	+

$$(-\infty, -3) \cup (-2, -1) \cup (1, 2) \cup (3, +\infty)$$

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$$الف) y = \sqrt{\frac{x^2 - x - 4}{x^2 - 12x^2 + 4}}$$

$$x^2 - x - 4 > 0 \rightarrow (x-2)(x+2) > 0$$

$$x^2 - 12x^2 + 4 > 0 \rightarrow (x^2 - 4)(x^2 - 2) > 0$$

$$(x-2)(x+2)(x-2)(x+2) > 0$$

$$(x-2)(x+2)(x-2)(x+2) > 0$$

	-3	-2	2	3
$x^2 - x - 4$	-	-	-	+
$x^2 - 12x^2 + 4$	-	+	+	+
y	+	+	-	+

$$(-\infty, -3) \cup (-2, 2) \cup (3, +\infty)$$

$$b) y = \sqrt{[x]-1} + \sqrt{1-[x]}$$

$$[x]-1 \geq 0 \rightarrow [x] \geq 1 \rightarrow x \geq 1 \quad \text{I} \quad \text{و د}$$

$$1-[x] \geq 0 \rightarrow 1 \geq [x] \rightarrow x \leq 1 \quad \text{II}$$

$$1 \leq x \leq 1 \Rightarrow [1, 1] \quad x \leq 1 \quad \text{I}$$

$$\text{I} \cap \text{II} \rightarrow D_f = \emptyset$$

$$a) y = \sqrt{1-[x]-1}$$

①

$$1-[x]-1 \geq 0 \rightarrow -[x] \geq 0 \rightarrow [x] \leq 0$$

$$[x] \leq 0$$

$$b) \sqrt{1-[x]-1}$$

$$1-[x]-1 \geq 0 \rightarrow -[x] \geq 0 \rightarrow [x] \leq 0$$

$$\rightarrow [x] \leq 0 \rightarrow [x] \leq 0$$

$$[x] \leq 0$$

$$b) y = \sqrt{\frac{x+1}{|x-1|}} + \sqrt{\frac{4-x}{x^2+1x+1}}$$

②

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

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

$$4-x \geq 0 \rightarrow 4 \geq x$$



$$[-1, 4] - \{1\}$$

$$\text{الف - ۲)} \quad \sin \frac{\pi}{4} + \cos \pi + 2 \tan \frac{\pi}{4} = \frac{1}{\sqrt{2}} + (-1) + 2(-1) = -\frac{\sqrt{2}}{2} \in (-2, \infty)$$

$$\text{ب - ۲)} \quad -\cos \frac{\pi}{4} + \sin \frac{\pi}{3} - 3 \sin \frac{\pi}{6} = -(-\frac{\sqrt{2}}{2}) + \frac{\sqrt{3}}{2} - 3(-\frac{1}{2}) = \frac{3\sqrt{2}}{2}$$

$$\text{ج - ۲)} \quad \cot \frac{\pi}{3} + 3 \cot \frac{\pi}{6} - 2 \tan \frac{\pi}{4} = -\frac{\sqrt{3}}{3} + 3(\sqrt{3}) - 2(-\frac{\sqrt{2}}{2}) = \frac{4\sqrt{3}}{3}$$

$$\text{ب - ۱۰)} \quad y = \sqrt{[x] - 4} + \sqrt{4 - [x]}$$

$$\xrightarrow{I \cap II} D_f = \emptyset \quad \text{همه عددی نداریم نه از ۴ بزرگتر و ۳ کمتر یا ۴ تا}$$

$$\begin{cases} [x] - 4 \geq 0 \rightarrow x \geq 4 \quad I \\ \quad \hookrightarrow [x] \geq 4 \\ \\ 4 - [x] \leq 0 \rightarrow x \leq 4 \quad II \\ \quad \hookrightarrow [x] \leq 4 \end{cases}$$