

$$(x^2 - \varepsilon x + 1) + (y^2 + 4y + 9) = 0 \rightarrow \underbrace{x^2 - \varepsilon x + 1}_{(x-1)^2} + \underbrace{(y+2)^2}_{y+2=0 \rightarrow y=-2} = 0$$

$$x-1=0 \rightarrow x=1$$

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

$$k = 9 + 2 = 11$$

$$x=a \Rightarrow a^2 + \varepsilon a = 2a + a + 2$$

$$a^2 + \varepsilon a = 3a + 2 \Rightarrow a^2 + a - 2 = 0 \rightarrow (a+2)(a-1) = 0$$

$$a = -2 \text{ or } a = 1 \rightarrow a > 0$$

$$f(a) = \begin{cases} x^2 + \varepsilon x & x \geq 1 \\ 2x + 2 & x \leq 1 \end{cases} \Rightarrow f(1) = 1 + \varepsilon = \omega$$

$$|x+1| \geq 2 \rightarrow \begin{matrix} (x+1 \geq 2)^{-1} \\ x \geq 1 \end{matrix} \leq \begin{matrix} (x+1 \leq -2)^{-1} \\ x \leq -3 \end{matrix}$$

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

$$1 \wedge -b = a - 4 \Rightarrow a + b = 2\varepsilon$$

$$\begin{cases} 4x - a \geq 0 \rightarrow 4x \geq a \rightarrow x \geq \frac{a}{4} \\ b - 2x \geq 0 \rightarrow 2x \leq b \rightarrow x \leq \frac{b}{2} \end{cases} \rightarrow \begin{matrix} \frac{a}{4} = 2 \rightarrow a = 8 \\ \frac{b}{2} = 2 \rightarrow b = 4 \end{matrix}$$

$$\frac{b}{a} = \frac{4}{8} = \frac{1}{2}$$

$$f(x) = \sqrt{\frac{x+1}{|x-3|}} + \sqrt{\frac{4-x}{x^2+4x+8}}$$

$$x = -1 \text{ or } x = 4$$

	-3	-1	3
$x+1$	-	-	+
$ x-3 $	+	+	+
$f(x)$	-	-	+

$$D_f(x) = [-1, 3) \cup (3, +\infty)$$

$$D_f \cap D_f \Rightarrow [-1, 4] - \{2, 3\} \subseteq [-1, 2) \cup (2, 3) \cup (3, 4]$$

$$\sqrt{[x]} - \varepsilon + \sqrt{2 - [x]} \Rightarrow [x] - \varepsilon \geq 0 \Rightarrow [x] \geq \varepsilon \rightarrow [x] \geq 3 \rightarrow D_f(x)$$

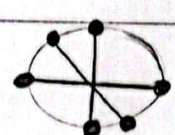
$$2 - [x] \geq 0 \rightarrow [x] \leq 2 \rightarrow [x] \leq 3 \rightarrow D_f \cap D_f \rightarrow \emptyset$$

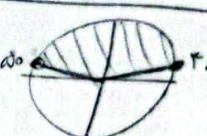
الف) $x^2 - 4x - 4 \rightarrow (x-2)(x+2) \rightarrow x=2, -2$
 $x^2 - 13x + 36 \rightarrow (x-4)(x-9) \rightarrow x=4, 9$
 $Df(x) = (-\infty, -2) \cup (2, 4) \cup (9, +\infty)$

ب) $(x-1)(x-3)(x+2) \rightarrow x=1, 3, -2$
 $(x+1)(x+3)(x-2) \rightarrow x=-1, -3, 2$
 $Df = (-\infty, -3) \cup [-2, -1) \cup [1, 2) \cup [3, +\infty)$

الف) $[x] - 2 \geq 0 \rightarrow [x] \geq 2 \rightarrow -x \geq 2 \rightarrow x \leq -2 \Rightarrow Df = (-\infty, -2]$

ب) $[x]^2 - 2[x] - 3 \neq 0 \rightarrow t^2 - 2t - 3 \neq 0 \rightarrow t \neq -1, 3 \rightarrow [x] \neq -1, 3 \rightarrow -1 < x < 0 \text{ or } x \geq 3$
 $Df = \mathbb{R} - ([-1, 0) \cup [3, \infty))$

الف) $\cot x + 1 \neq 0 \rightarrow \tan x \neq -1$

 $Df = \mathbb{R} - \{k\pi + \frac{3\pi}{4}, k\pi + \frac{7\pi}{4}\}$

ب) $1 - \sin^2 x \geq 0 \rightarrow \sin^2 x \leq 1 \rightarrow \sin x \leq \frac{1}{2} \rightarrow -\frac{1}{2} \leq \sin x \leq \frac{1}{2}$

 $Df = [2k\pi + \frac{3\pi}{4}, 2k\pi + \frac{\pi}{4}]$

الف) $1 - \log_{\frac{1}{2}} x \geq 0 \rightarrow \log_{\frac{1}{2}} x \leq 1 \rightarrow (\frac{1}{2})^1 \leq x \rightarrow x \geq \frac{1}{2}$
 $Df(x) = [\frac{1}{2}, \infty)$

ب) $x^2 - 4x + 4 \geq 0 \rightarrow (x-2)^2 \geq 0 \rightarrow x=2$
 $1 - \log_{\frac{1}{2}} x \neq 0 \rightarrow \log_{\frac{1}{2}} x \neq 1 \rightarrow x \neq \frac{1}{2}$
 $Df = (-\infty, -1) \cup (-1, 0) \cup (0, \frac{1}{2}) \cup (\frac{1}{2}, 2) \cup (2, \infty)$

الف) $x^2 - 4x + 4 \geq 0 \rightarrow (x-2)^2 \geq 0 \rightarrow x=2$
 $Df = [1, 3]$

ب) $\frac{x\omega + \omega}{x\omega + \omega} \in \mathbb{N} \rightarrow x = -\frac{\omega - \omega}{\omega - \omega} \rightarrow \frac{\omega - \omega}{\omega - \omega} = 1$
 $Df = \{x \mid x = \frac{\omega - \omega}{\omega - \omega}, \omega \in \mathbb{N}\}$