

الف) $y = \sqrt{\frac{n^2-4n}{n^3-n}} \rightarrow \frac{n^2-4n}{n^3-n} \geq 0 \rightarrow \frac{n(n-4)}{n(n^2-1)} \geq 0 \rightarrow \frac{n(n-4)}{n(n-1)(n+1)} \geq 0$

$P_f = (-1, 0) \cup (0, 1) \cup [4, +\infty)$

$\frac{-1}{-1} + \frac{0}{0} + \frac{1}{1} + \frac{4}{4} = 1$

ب) $\frac{n^4-n^3}{n^3-n} \geq 0 \rightarrow \frac{n^3(n-1)}{n(n^2-1)} \geq 0 \rightarrow \frac{n^2(n-1)(n+1)}{n(n-1)(n+1)} \geq 0$

$\frac{-1}{-1} + \frac{0}{0} + \frac{1}{1} + \frac{1}{1} = 1$

$P_f = \mathbb{R} - \{ \pm 1, 0 \}$

الف) $n+|n| \geq 0 \rightarrow \begin{matrix} n+ \rightarrow \checkmark \\ n- \rightarrow \times \\ 0 \rightarrow \times \end{matrix}$

$P_f = (0, +\infty)$

ب) $n/|n| \geq 0 \rightarrow \begin{matrix} n+ \rightarrow \checkmark \\ n- \rightarrow \times \\ 0 \rightarrow \times \end{matrix}$

$P_f = (0, +\infty)$

الف) $x \in [a] \geq 0 \Rightarrow x \in [a] \Rightarrow P_f = (-\infty, 3)$

ب) $x \in [a] \geq 0 \Rightarrow x \in [a] \Rightarrow P_f = (-\infty, 2)$

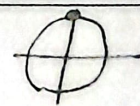
الف) $[x - \frac{1}{x}] + [x + \frac{2}{x}] \geq 0 \xrightarrow{+1} [x - \frac{1}{x} + 1] + [x + \frac{2}{x}] \geq 1 \rightarrow [x + \frac{1}{x}] + [x + \frac{2}{x}] \geq 1$

$\rightarrow 2[x + \frac{2}{x}] \geq 1 \rightarrow [x + \frac{2}{x}] \geq \frac{1}{2} \xrightarrow{\text{در مخرج بسط}} x + \frac{2}{x} \geq \frac{1}{2} \Rightarrow x \geq \frac{1}{4} \Rightarrow P_f = [\frac{1}{4}, +\infty)$

ب) $[x - \frac{1}{x}] + [x + \frac{1}{x}] \geq 0 \rightarrow [x - \frac{1}{x}] + [-(x - \frac{1}{x})] \xrightarrow{\text{if}} \begin{cases} a \in \mathbb{Z} & [a] + [-a] = 0 \\ a \notin \mathbb{Z} & [a] + [-a] = -1 \end{cases}$

$P_f = \{n | x = k + \frac{1}{x} \text{ و } k \in \mathbb{Z}\} \Leftarrow x - \frac{1}{x} \in \mathbb{Z}$

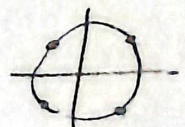
الف) $\sin x - 1 \neq 0 \Rightarrow \sin x \neq 1 \Rightarrow P_f = \mathbb{R} - \{2k\pi + \frac{\pi}{2}\}$



ب) $2 \sin^2 x - 1 \neq 0 \Rightarrow 2 \sin^2 x \neq 1 \Rightarrow \sin^2 x \neq \frac{1}{2} \Rightarrow \sin x \neq \pm \frac{1}{\sqrt{2}}$

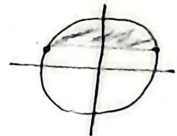
$P_f = \mathbb{R} - \{ \frac{k\pi}{2} + \frac{\pi}{4} \}$

$= \pm \frac{\sqrt{2}}{2}$



الف) $r \sin n - 1 \geq 0 \Rightarrow r \sin n \geq 1 \Rightarrow \sin n \geq \frac{1}{r}$

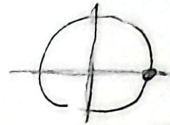
$$D_f = \mathbb{R} - \left[r k \pi + \frac{\pi}{2}, r k \pi + \frac{5\pi}{2} \right]$$



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ب) $\cos n - 1 \geq 0 \Rightarrow \cos n \geq 1$

$$D_f = \{ 2k\pi \}$$



عبارت مقابل الف
من $[-1, 1]$

$$\Rightarrow \frac{1}{|x|} - 3 \leq 1 \Rightarrow \frac{1}{|x|} \leq 4 \Rightarrow \frac{1}{4} \leq |x| \leq 1$$

$$D_f = [-\frac{1}{4}, -\frac{1}{2}] \cup [\frac{1}{2}, \frac{1}{4}]$$

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ب) $-1 \leq n^2 + 3n + 1 \leq 1$

$$\begin{cases} n^2 + 3n + 1 \leq 1 \rightarrow n^2 + 3n \leq 0 \Rightarrow n(n+3) \leq 0 \Rightarrow \frac{-3}{-3+0} \leq n \leq \frac{-1}{-1+0} \\ n^2 + 3n + 1 \geq -1 \rightarrow n^2 + 3n \geq -2 \Rightarrow (n+1)(n+2) \geq 0 \Rightarrow \frac{-2}{-2+0} \leq n \leq \frac{-1}{-1+0} \end{cases}$$

$$D_f = [-\frac{3}{2}, -\frac{1}{2}] \cup [-1, 0]$$

الف) $r - \log_r(n-2) \geq 0 \Rightarrow r \geq \log_r(n-2) \Rightarrow r \geq n-2 \Rightarrow n \leq r+2$

$$D_f = (r, r+2]$$

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ب) $\log(n^2 - n) \geq 0 \Rightarrow n^2 - n \geq 1 \Rightarrow n(n-1) \geq 1 \Rightarrow n(n+1)(n-1) \geq 0$

$$D_f = (-1, 0) \cup (1, +\infty)$$

$$\frac{-1}{-1+0} \leq n \leq \frac{0}{0+0} + \frac{1}{1+0}$$

الف) $\varepsilon^{n+1} \neq 0 \Rightarrow \varepsilon^n \neq -1 \Rightarrow D_f = \mathbb{R}$

ب) $\varepsilon^n - 1 \neq 0 \Rightarrow \varepsilon^n \neq 1 \Rightarrow n \neq 0 \Rightarrow D_f = \mathbb{R} - \{0\}$

2) $\varepsilon^n - 2 \neq 0 \Rightarrow \varepsilon^n \neq 2 \Rightarrow n \neq \log_\varepsilon 2 \Rightarrow D_f = \mathbb{R} - \log_\varepsilon 2$

3) $\varepsilon^n - 3 \neq 0 \Rightarrow \varepsilon^n \neq 3 \Rightarrow n \neq \log_\varepsilon 3 \Rightarrow D_f = \mathbb{R} - \log_\varepsilon 3$

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الف) $\varepsilon_{n+1} \in W \Rightarrow \varepsilon_n \in W-1 \Rightarrow n \in \frac{W-1}{\varepsilon} \Rightarrow D_f = \{ n \mid n = \frac{k-1}{\varepsilon}, k \in W \}$

ب) $\left(\frac{\varepsilon_n - 2}{\varepsilon_n - d} \right) \in W \Rightarrow \frac{\varepsilon_n - 2}{\varepsilon_n - d} \in W \Rightarrow \varepsilon_n - 2 = (\varepsilon_n - d)w \Rightarrow \varepsilon_n - 2w\varepsilon_n = +2 - dw \Rightarrow$

$$D_f = \{ n \mid n = \frac{2-dk}{\varepsilon - \varepsilon k}, k \in W \}$$

$$n = \frac{+2-dw}{\varepsilon - \varepsilon w}$$

←