

الف) $x^3 + 3x^2 - 11x + 3 = 0 \xrightarrow{\text{بیشترین درجه 3}} (x-1)(2x^2 + 5x - 3) \rightarrow \Delta = 25 + 24 = 49 \Rightarrow x = \frac{-5 \pm 7}{4}$
 $D_f = \{x \in \mathbb{R} - \{-3, 1, \frac{1}{2}\}\}$ $x = 1, \frac{1}{2}, -3$

ب) $x^3 + 9x^2 + 14x + 3 = 0 \Rightarrow (x+1)(2x^2 + 7x + 3) \rightarrow \Delta = 49 - 24 = 25 \Rightarrow x = \frac{-7 \pm 5}{4}$
 $D_f = x \in \mathbb{R} - \{-1, -\frac{3}{2}, -\frac{1}{2}\}$ $x = -1, -\frac{3}{2}, -\frac{1}{2}$

الف) $x^3 - 2x^2 + 2x - 1 = 0 \Rightarrow (x-1)(x^2 - x + 1) \rightarrow \Delta = 1 - 4 = -3 \Rightarrow$ ریشه حقیقی ندارد!
 $D_f = \mathbb{R} - \{1\}$

ب) $\frac{x+3}{x^3 - 2x^2 + 2x} \geq 0 \Rightarrow D_f = (-\infty, -3] \cup (0, +\infty)$
 $x^3 - 2x^2 + 2x \neq 0 \rightarrow x(x^2 - 2x + 2) \rightarrow \Delta < 0 \Rightarrow$ پس هیچ جایی که مخرج 0 نباشد، $x=0$ است.
 $\Rightarrow \begin{cases} \text{مخرج} \rightarrow x = -3 \\ \text{مخرج} \rightarrow x = 0 \end{cases}$

$x^2 - 5|x| - |x+5| \neq 0$
 ① $-5 < x \rightarrow |x| = -x \Rightarrow |x+5| = -(x+5) = -x-5$
 معادله: $x^2 - 5(-x) - (-x-5) = x^2 + 5x + x + 5 = x^2 + 6x + 5 \Rightarrow (x+1)(x+5)$ $\begin{cases} x = -1 \\ x = -5 \end{cases}$
 ② $x < -5 \rightarrow 5+x = |5+x| \Rightarrow$ معادله: $x^2 - 5(-x) - (x+5) = x^2 + 5x - x - 5 = x^2 + 4x - 5 \Rightarrow (x+5)(x-1)$ $\begin{cases} x = -5 \\ x = 1 \end{cases}$
 ③ $x \geq 0 \rightarrow$ معادله: $x^2 - 5x - (x+5) = x^2 - 6x - 5 = \begin{cases} x = 3 + \sqrt{14} \\ x = 3 - \sqrt{14} \end{cases}$
 $D_f = \mathbb{R} - \{-5, 3 + \sqrt{14}\}$

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

ب) ضرورت همیشگی مثبت است. چون x^2 همیشه مثبت است. منفی نمی شود.

$[x]^2 - 2[x] - 3 \neq 0 \xrightarrow{[x]=t} t^2 - 2t - 3 = 0 \Rightarrow (t-3)(t+1) = 0 \Rightarrow \begin{cases} t = 3 \\ t = -1 \end{cases}$
 $D_f = \mathbb{R} - \{[3, 4) \cup [-1, 0)\}$

الف) $x - \frac{1}{x} \geq 0 \Rightarrow x \geq \frac{1}{x} \text{ و } x + \frac{1}{x} \geq 0 \Rightarrow x \geq -\frac{1}{x} \xrightarrow{\text{هر دو شرط}} x \geq \frac{1}{x}$
 $D_f = [\frac{1}{x}, +\infty)$

ب) $x - \frac{1}{x} \geq 0 \Rightarrow x \geq \frac{1}{x} \text{ و } \frac{1}{x} - x \geq 0 \Rightarrow x \leq \frac{1}{x} \Rightarrow x = \frac{1}{x}$

الف) $x \neq \frac{\mu}{\epsilon} + k\mu$

ب) $\tan x + 1 \neq 0 \Rightarrow \tan x \neq -1 \Rightarrow x \neq -\frac{\pi}{4} + k\pi$

ج) $\cot x = \frac{1}{\tan x} \Rightarrow x \neq k\pi$

$D_f = \left\{ k\mu, \frac{\mu}{\epsilon} + k\mu, -\frac{\mu}{\epsilon} + k\mu \right\}$

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

$D_f = \left\{ [r k \mu, r k \mu + \frac{\mu}{\epsilon}] \cup [r k \mu + \frac{\mu}{\epsilon}, r k \mu + \frac{\sqrt{\mu}}{\epsilon}] \cup [r k \mu + \frac{11\mu}{\epsilon}, r k \mu + \mu] \right\}$

الف) $\epsilon \sin x - 1 \geq 0 \Rightarrow \sin x \geq \frac{1}{\epsilon}$

$D_f = \left\{ \left[\frac{\mu}{\epsilon} + r k \mu, \frac{\mu}{\epsilon} + r k \mu \right] \right\}$

ب) $1 - \epsilon \cos x \geq 0 \Rightarrow \cos x \leq \frac{1}{\epsilon}$

$D_f = \left\{ \left[\frac{\mu}{\epsilon} + r k \mu, \frac{\mu}{\epsilon} + r k \mu \right] \right\}$

الف) $-1 \leq x^2 + 3x + 1 \leq 1$

$\begin{cases} -1 \leq x^2 + 3x + 1 \Rightarrow x^2 + 3x + 2 \geq 0 \Rightarrow (x+1)(x+2) \geq 0 \Rightarrow x \leq -2 \text{ or } x \geq -1 \\ x^2 + 3x + 1 \leq 1 \Rightarrow x^2 + 3x \leq 0 \Rightarrow x(x+3) \leq 0 \Rightarrow -3 \leq x \leq 0 \end{cases}$

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

ب) $0 \leq \sqrt{5-2x} \leq 1$

$\begin{cases} 0 \leq \sqrt{5-2x} \Rightarrow x \leq \frac{5}{2} \\ \sqrt{5-2x} \leq 1 \Rightarrow x \geq 2 \end{cases} \Rightarrow 2 \leq x \leq \frac{5}{2}$

$D_f = \left[2, \frac{5}{2} \right]$

الف) $1 - \log_3 x > 0 \Rightarrow \log_3 x < 1 \Rightarrow x < 3, x > 0$

$D_f = (0, 3)$

ب) $1 - \log_{\frac{x}{2}} x > 0 \Rightarrow \log_{\frac{x}{2}} x < 1 \Rightarrow x > \frac{1}{2} \text{ or } x < 0$

$D_f = \left(\frac{1}{2}, +\infty \right)$

الف) $\epsilon x - x^2 \geq 0 \Rightarrow x^2 - \epsilon x \leq 0 \Rightarrow x(x - \epsilon) \leq 0 \Rightarrow 0 \leq x \leq \epsilon$

$D_f = [0, \epsilon]$

ب) $\epsilon x + \delta \neq 0 \Rightarrow x \neq -\frac{\delta}{\epsilon}$

ج) $\frac{\epsilon x + \delta}{x + \epsilon} \geq 0 \Rightarrow \epsilon x + \delta = n(\epsilon x + \epsilon) \Rightarrow x = \frac{\epsilon n - \delta}{\epsilon - n} \rightarrow \epsilon - n \neq 0 \rightarrow n \neq \epsilon$

$D_f = \left\{ \frac{\epsilon n - \delta}{\epsilon - n} \mid n \in \mathbb{Z} \right\}$