

الف) $\frac{x+3}{2x^3+3x^2-8x+3} \quad (x-1)(2x^2+5x+3) \neq 0$
 $2x^3+3x^2-8x+3 \hookrightarrow x \in \mathbb{R} - \{1, -3, \frac{1}{2}\}$
 $2x^3+3x^2-8x+3 \neq 0 \quad 2+3-8+3=0$
 $2x^3+3x^2-8x+3 \mid \frac{x-1}{2x^2+5x+3}$
 $2x^2+5x-3=0 \rightarrow x^2+5x-4=0 \rightarrow x=-3, \frac{1}{2}$

ب) $\frac{x+3}{2x^3+9x^2+10x+3} \quad (x+1)(2x^2+9x+3) \neq 0$
 $2x^3+9x^2+10x+3 \hookrightarrow x \in \mathbb{R} - \{-1, -\frac{1}{2}, -3\}$
 $2x^3+9x^2+10x+3 \neq 0$
 $2x^3+9x^2+10x+3 \mid \frac{x+1}{2x^2+7x+3} \quad 9+3=2+1$
 0
 $2x^2+7x+3=0 \rightarrow x^2+7x+4=0 \rightarrow x=-3, -\frac{1}{2}$

الف) $\frac{x+3}{x^3-2x^2+2x-1} \rightarrow x^3-2x^2+2x-1 \neq 0$
 $1+2-2-1=0 \quad x^3-2x^2+2x-1 \mid \frac{x-1}{x^2-x+1}$
 $x^2-x+1 \rightarrow \Delta < 0 \rightarrow$ ریشه ندارد
 $(x-1)(x^2-x+1)=0 \rightarrow x \in \mathbb{R} - \{1\}$

ب) $\frac{x+3}{x^3-2x^2+2x-1} > 0$

x	-3	1
	-	+

 $x \in (-\infty, -3] \cup (1, +\infty)$

$\frac{2}{x^2-5|x-1|-2x+5} \rightarrow x^2-5|x-1|-2x+5 \neq 0 \quad \textcircled{1} \cup \textcircled{2} \rightarrow x \in \mathbb{R} - \{2, 5, 0, -3\}$
 $x > 0 \rightarrow x^2-5x-2x+10 \neq 0 \rightarrow x^2-7x+10 \neq 0 \rightarrow (x-2)(x-5) \neq 0$
 $x \neq 2, 5 \quad \textcircled{1}$
 $x \leq 0 \rightarrow x^2+5x-2x+5-5 \neq 0 \rightarrow x^2+3x \neq 0 \rightarrow x(x+3) \neq 0$
 $x \neq 0, -3 \quad \textcircled{2}$

الف) $\frac{x+3}{|2x+1|-|x+3|} \rightarrow |2x+1|-|x+3| \neq 0$
 $-3 \quad -\frac{1}{2} \quad x \in \mathbb{R} - \{-\frac{3}{2}, 2\}$

2-x	-3x-4	x-2
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 $x < -3 \rightarrow 2-x > 0 \rightarrow x < 2 \rightarrow x < -3 \quad \textcircled{1}$
 $-3 \leq x < -\frac{1}{2} \rightarrow -3x-4 > 0 \rightarrow x < -\frac{4}{3} \rightarrow -3 \leq x < -\frac{4}{3} \quad \textcircled{2}$
 $x > -\frac{1}{2} \rightarrow x-2 > 0 \rightarrow x > 2 \rightarrow x > 2 \quad \textcircled{3}$

ب) $|2x+1|-|x+3| > 0 \quad \textcircled{1} \cup \textcircled{2} \cup \textcircled{3}$
 $x \in (-\infty, -3) \cup [-\frac{4}{3}, -\frac{1}{2}) \cup [2, +\infty)$
 $x < -3 \rightarrow 2-x > 0 \rightarrow x < 2 \rightarrow x < -3 \quad \textcircled{1}$
 $-3 \leq x < -\frac{1}{2} \rightarrow -3x-4 > 0 \rightarrow x < -\frac{4}{3} \rightarrow -3 \leq x < -\frac{4}{3} \quad \textcircled{2}$
 $x > -\frac{1}{2} \rightarrow x-2 > 0 \rightarrow x > 2 \rightarrow x > 2 \quad \textcircled{3}$

الف) $\log_x^x \rightarrow x > 0 \quad \textcircled{1}$
 $\log_r(1-\log_x^x) \rightarrow 1-\log_x^x > 0 \rightarrow \log_x^x < 1$
 $\rightarrow x < 3 \quad \textcircled{2}$
 $\textcircled{1} \cap \textcircled{2} \rightarrow x \in (0, 3) \quad \checkmark$

ب) $\log_{\frac{x}{4}}^x \rightarrow x > 0 \quad \textcircled{1}$
 $\log_r(1-\log_{\frac{x}{4}}^x) \rightarrow 1-\log_{\frac{x}{4}}^x > 0$
 $\rightarrow \log_{\frac{x}{4}}^x < 1 \rightarrow x > \frac{1}{4} \quad \textcircled{2}$
 $\textcircled{1} \cap \textcircled{2} \rightarrow x \in (\frac{1}{4}, +\infty) \quad \checkmark$

$$\log_{\omega}^{(2x-1)} \rightarrow 2x-1 > 0 \rightarrow x > \frac{1}{2} \quad (1)$$

$$\log_{\omega} \log_{\omega}^{(2x-1)} \rightarrow \log_{\omega}^{(2x-1)} > 0 \rightarrow 2x-1 > 1 \rightarrow x > 1 \quad (2)$$

$$\log_{\omega} \log_{\omega}^{(2x-1)} \geq 0 \rightarrow \log_{\omega}^{(2x-1)} \leq 1 \rightarrow 2x-1 \leq \omega \rightarrow x \leq 3 \quad (3)$$

$$(1) \cap (2) \cap (3) \rightarrow x \in (1, 3] \quad \checkmark$$

الف) $\log_{10}^{(2\cos x + 1)} \rightarrow 2\cos x + 1 > 0$

$$\cos x > -\frac{1}{2}$$

$$x \in (2k\pi - \frac{2\pi}{3}, 2k\pi + \frac{2\pi}{3}) \quad \checkmark$$

ب- $\log_{10} \frac{x-1}{x+1} \rightarrow \frac{x-1}{x+1} > 0$

$$\frac{x - \frac{1}{2}}{x + \frac{1}{2}} \rightarrow x \in (-\infty, -\frac{1}{2}) \cup [\frac{1}{2}, +\infty) \quad (1)$$

$$(1) \cap (2) \rightarrow x \in (-\infty, -\frac{1}{2}) \quad \checkmark$$

$$\log_{10} \frac{x-1}{x+1} > 0 \rightarrow \frac{x-1}{x+1} > 1 \rightarrow \frac{-2}{x+1} > 0$$

$$\frac{x - \frac{1}{2}}{x + \frac{1}{2}} \rightarrow x \in (-\infty, -\frac{1}{2}) \quad (2)$$

اگر معادله درجه دو باشد جواب بازه به این شکل نیست پس تقعا معادله درجه یک است

$$\alpha + 2 = 0 \rightarrow \alpha = -2$$

$$f(x) = \sqrt{-2x + b}$$

$$-2x + b \geq 0 \rightarrow x \leq \frac{b}{2} \rightarrow b = -4 \quad \checkmark$$

$$x^2 + 2x + 2 - m^2 \geq 0 \rightarrow \Delta \geq 0 \quad \checkmark$$

$$\Delta = 4 - 4 + 4m^2$$

$$4m^2 - 4 \leq 0 \quad \frac{x - \frac{1}{2}}{x + \frac{1}{2}}$$

$$x \in [-1, 1] \rightarrow m_{\max} - m_{\min} = 1 - (-1) = 2 \quad \checkmark$$

$$4 - x^2 \geq 0 \quad \frac{x - \frac{2}{3}}{x + \frac{2}{3}} \quad x \in [-2, 2] \quad (1)$$

$$\{x\} + \{-x\} + 1 \neq 0 \rightarrow x \neq \mathbb{R} - \mathbb{Z} \rightarrow x \in \mathbb{Z} \quad (2)$$

$$(1) \cap (2) \rightarrow x \in \{-2, -1, 0, 1, 2\} \rightarrow \text{پنج عدد صحیح} \quad \checkmark$$