

الف) $y = x^3 - 3x^2 + 3x + 1 - 1 \rightarrow y = (n-1)^3 + 1$ (سوال 1)
 $y-1 = (n-1)^3 \rightarrow \sqrt[3]{y-1} = n-1$

$$n = \sqrt[3]{y-1} + 1 \rightarrow \mathbb{R} = \mathbb{R}$$

ب) $y = \frac{1}{x^2 - 2x}$ $2n^2 - 2n - 1 = 0 \rightarrow \Delta = 4 - 4(-1 \times 2) = 4 + 8 = 12$

$$n = \frac{2 \pm \sqrt{12}}{4} = \frac{2 \pm 2\sqrt{3}}{4} = \frac{1 \pm \sqrt{3}}{2}$$

$$2x^2 - 2x - 1 = 0 \rightarrow x \neq 0$$

$$2x(x+1) \geq 0$$

$$\begin{array}{c} + \\ - \\ + \end{array}$$

$$x \in (-1, 0) \cup [0, +\infty)$$

$$\mathbb{R} = \textcircled{\text{I}} \cap \textcircled{\text{II}} = (-\infty, -1] \cup (0, +\infty)$$

الف) $n^2 - 6n + 10$

$$x_{\min} = \frac{-b}{2a} = \frac{+6}{2} = 3$$

$$y = 9 - 18 + 10 = 1 \rightarrow \mathbb{R} = [1, +\infty)$$
 (سوال 2)

ب) $-x^2 + 4x + 3$

$$x_{\max} = \frac{-b}{2a} = \frac{-4}{-2} = 2$$

$$y_{\max} = -9 + 16 + 3 = 10$$

$$\mathbb{R} = (-\infty, 10]$$

ج) $\sqrt{x^2 - 4x - 3}$

$$x_{\min} = \frac{-b}{2a} = \frac{+4}{2} = 2$$

$$y_{\min} = 4 - 8 - 3 = -7$$

$$\mathbb{R} = [-7, +\infty) \rightarrow [0, +\infty)$$

د) $\sqrt{4x - x^2}$
 $-x^2 + 4x$

$$x_{\max} = \frac{-b}{2a} = \frac{-4}{-2} = 2$$

$$y_{\max} = -4 + 16 = 12$$

$$\mathbb{R} = [-4, 4] \rightarrow [0, 4]$$

الف) $y = x^3 - 3x^2 + 3x + 1$ $\mathbb{R}_f = \mathbb{R}$ (سوال 3)

ب) $y = x^4 - 4x^3 + 3x^2 + 2$ $\mathbb{R}_f = \mathbb{R}$

ج) $\sqrt{x^4 - 4x^3 + 3x^2 + 1}$ $\mathbb{R}_f = [0, +\infty)$

د) $\sqrt{(x^3 - 3x^2 + 3x + 1)^2}$ $\mathbb{R}_f = [0, +\infty)$

الف) $y = \frac{3x+1}{x-2}$

$R_f = \mathbb{R} - \{2\}$

سوال (٤)

ب) $y = \frac{4x^2+1}{x+1}$

$R_f = \mathbb{R} - \{2\}$

الف) $y = \sqrt{\frac{2x+4}{x-1}}$

$R_f = \sqrt{\mathbb{R} - \{1\}} \rightarrow [0, +\infty) - \{1\}$

سوال (٥)

ب) $y = \sqrt{\frac{3x+1}{2-x}}$

$R_f = \sqrt{\mathbb{R} - \{2\}} \rightarrow [0, +\infty)$

الف) $y = \frac{2x-3}{x+1}$

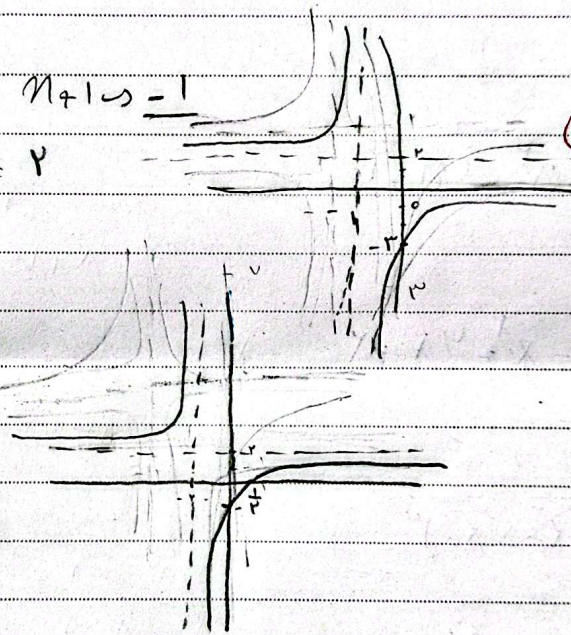
مجاذات = $x+1 \rightarrow -1$
مجاذ افقي = $y = 2$

$x=0 \rightarrow y = -3$

ب) $y = \frac{2x-1}{x+2}$

مجاذات = -2
مجاذ افقي = $y = 2$

$x=0 \rightarrow y = -\frac{1}{2}$
 $x=3 \rightarrow y = \frac{5}{5}$



سوال (٧)

الف) $y = \sin x + \frac{1}{\sin x}$

$R_f = (-\infty, -1] \cup [1, +\infty)$

ب) $y = \frac{x^2}{x^3} + 1$

$\rightarrow x + \frac{1}{x^3} \rightarrow R_f = (-\infty, -1] \cup [1, +\infty)$

ج) $\frac{\sqrt{x^2+1}}{\sqrt{x}} \rightarrow \sqrt{\frac{x^2}{x}} + \frac{1}{\sqrt{x}} \rightarrow \sqrt{x} + \frac{1}{\sqrt{x}} \rightarrow R_f = (-\infty, -1] \cup [1, +\infty)$

د) $\sqrt{x} + \frac{1}{\sqrt{x}} \rightarrow [1, +\infty)$

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الف) $x^2 + \frac{1}{x^2+3} \geq 2$ $\Rightarrow x^2 + 3 + \frac{1}{x^2+3} - 3 \geq 2$

مسئله (1) $R_f = (-\infty, +\infty)$

$T + \frac{1}{T} \geq 2$ $\Rightarrow T + \frac{1}{T} - 3 \geq 2$ $\Rightarrow T + \frac{1}{T} \geq 5$

ب) $\frac{x^2+\omega}{\sqrt{x^2+2}} \geq \frac{x^2+1}{\sqrt{x^2+2}} \Rightarrow \sqrt{x^2+2} + \frac{1}{\sqrt{x^2+2}} \geq 2 + \frac{1}{2} = \frac{5}{2}$

$R_f = [\frac{5}{2}, +\infty)$

(2) کمترین مقدار معلوم کرنے کے لیے

$x = 3$ $x = -\frac{2}{3}$

مسئله (9) $q = |x-3| + |3x+1|$

$x-3+3x+1$ $x > 3$

$3x+1$ $x > 3$

$-\frac{1}{3} + \frac{3}{3} = \frac{2}{3}$

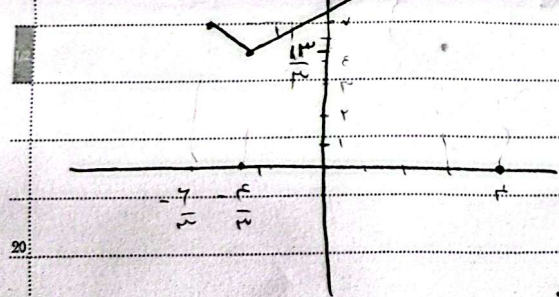
$-x+3+3x+1$ $-\frac{2}{3} \leq x \leq 3$

$2x+4$ $-\frac{2}{3} \leq x \leq 3$ $2x - \frac{2}{3} + 4 = \frac{10}{3} + 2x$

$-x+3-3x-1$ $x < -\frac{2}{3}$

$-(x-1)$ $x < -\frac{2}{3}$

$-\frac{1}{3} - \frac{2}{3} = -1$ $1 - \frac{2}{3} = \frac{1}{3}$ $\frac{1}{3} - \frac{2}{3} = -\frac{1}{3}$



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$3x$ $x-3+3x+1$ $x > 3$

$x=3$ $x=-1$

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

الف) $q = |x-2| + |2x+1|$

$-x+2-2x-1$ $x < -1$

$-3x$

ب) $q = |2x-2| + |x+1|$ $x=2$ $x=1$ $x=-1$

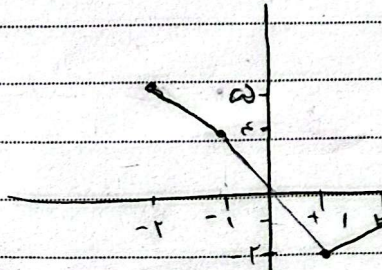
$R_f = [1, +\infty)$

$2x-2-x-1$ $x > 1$

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

$-x+2+2x+1$ $x < -1$

$-x+1$



$R_f = [-1, +\infty)$

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