

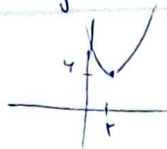
الف) $y = x^3 - 3x^2 + 3x + 1 - 1 = (x-1)^3 + 1 \rightarrow y-1 = (x-1)^3$
 $1 + \sqrt[3]{y-1} = x$ $R_f: \mathbb{R}$

ب) $y = \frac{1}{x^2 - 2x} \rightarrow yx^2 - 2yx - 1 = 0$ $\Delta \geq 0 \rightarrow 4y^2 + 4y \geq 0 \rightarrow y(y+1) \geq 0$
 $x = \frac{2y \pm \sqrt{\Delta}}{2y} \rightarrow y \neq 0$ $R_f: (-\infty, -1] \cup (0, +\infty)$

ج) $y = x^2 - 2x + 1$

$-\frac{b}{2a} = \frac{2}{2} = 1$

$-\frac{\Delta}{4a} = 0$



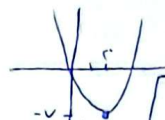
$R_f: [0, +\infty)$

د) $y = \sqrt{x^2 - 2x - 2}$

$x^2 - 2x - 2 \geq 0$

$-\frac{b}{2a} = \frac{2}{2} = 1$

$f(1) = 1 - 2 - 2 = -3$

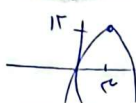


$R_f: [-1, +\infty)$

هـ) $y = -x^2 + 4x + 3$

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

$f(2) = -4 + 8 + 3 = 7$



$R_f: (-\infty, 7]$

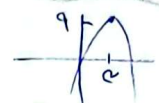
و) $y = \sqrt{4x - x^2}$

$-x^2 + 4x \geq 0$

$f(0) = 0$

$R = [0, 4]$

$R_f: [0, 2]$



ز) $y = x^3 - 2x^2 + 2x + 1 \rightarrow$ $R_f: \mathbb{R}$

ح) $y = x^3 - 4x^2 + 2x + 2 \rightarrow$ $R_f: \mathbb{R}$

ط) $y = \sqrt{x^2 - 4x + 4} + 1 \rightarrow y = x^2 - 4x + 4 + 1$ $R_f: [0, +\infty)$

ث) $y = (x^2 - 2x + 1)^2 \rightarrow y = A^2 \rightarrow A = 0$ $R_f: [0, +\infty)$

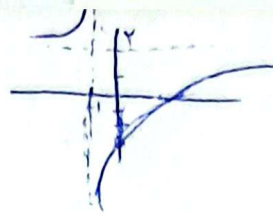
الف) $y = \frac{x+1}{x-2}$ $R_f: \mathbb{R} - \{2\}$

ب) $y = \frac{x+1}{x+1}$ $R_f: \mathbb{R} - \{-1\}$

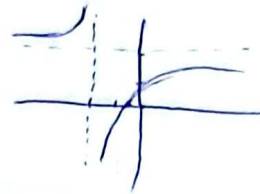
ج) $y = \sqrt{\frac{x+2}{x+1}}$ $R_f: [0, +\infty) - \{\sqrt{2}\}$

د) $y = \sqrt{\frac{x+1}{x-2}}$ $R_f: [0, +\infty)$

الف) $y = \frac{x-2}{x+1} \rightarrow \begin{matrix} \text{میانمایه} = \frac{a}{c} = 2 \\ \text{میانمایه کج} = \frac{b}{c} = -1 \end{matrix}$
 $f(1) = -3$



ب) $y = \frac{x-1}{x+2} \rightarrow \begin{matrix} \text{میانمایه} = \frac{a}{c} = 2 \\ \text{میانمایه کج} = \frac{b}{c} = -2 \end{matrix}$
 $f(0) = -\frac{1}{2}$



الف) $y = \sin x + \frac{1}{\sin x}$ $-1 \leq \sin x \leq 1$ $\rightarrow \mathbb{R}_f: (-\infty, -2] \cup [2, +\infty)$

ب) $y = \frac{x^2+1}{x^2} = x^2 + \frac{1}{x^2} \rightarrow \mathbb{R}_f: (-\infty, -2] \cup [2, +\infty)$

ج) $y = \frac{\sqrt{x^2+1}}{\sqrt{x}} = \sqrt{x} + \frac{1}{\sqrt{x}} \rightarrow \mathbb{R}_f: (-\infty, -2] \cup [2, +\infty)$

د) $y = \sqrt{x} + \frac{1}{\sqrt{x}} \rightarrow \mathbb{R}_f: [2, +\infty)$

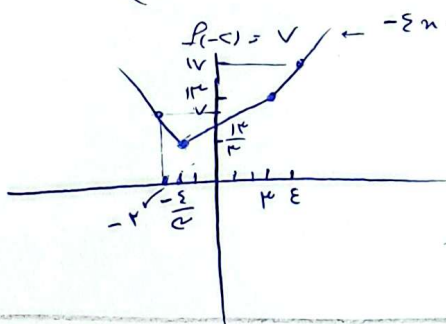
الف) $y = x^2 + \frac{1}{x^2+2} + 2 - 2 = x^2 + 2 + \frac{1}{x^2+2} - 2 \rightarrow \frac{1}{x} - 2 = \frac{1}{x} \rightarrow \mathbb{R}_f: [\frac{1}{x}, +\infty)$

تقریب: $2 + \frac{1}{x} = \frac{10}{x}$

$\mathbb{R}: [\frac{1}{x}, +\infty)$

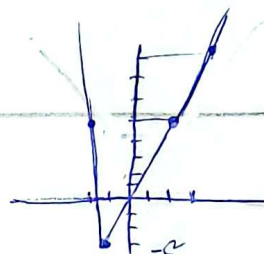
ب) $y = \frac{x^2+2}{\sqrt{x^2+2}} = \sqrt{x^2+2} + \frac{1}{\sqrt{x^2+2}} \rightarrow \text{تقریب: } 2 + \frac{1}{x} = \frac{5}{x} \rightarrow \mathbb{R}_f: [\frac{5}{x}, +\infty)$

$y = |x-2| + |x+2|$



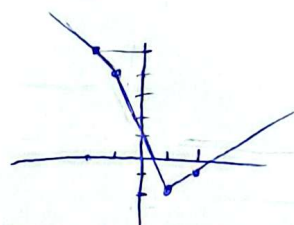
$\begin{matrix} -\frac{\epsilon}{2} & & 2 \\ \hline -x+2-x-\epsilon & | & x-x+x+\epsilon & | & x-2+x+2 \\ -\epsilon x-1 & | & x+1 & | & \epsilon x+1 \end{matrix}$
 $f(-2) = 4$
 $f(2) = 4$

الف) $y = |x-2| + |x+2|$



$\mathbb{R}_f: [-2, +\infty)$

ب) $y = |x-2| - |x+2|$



$\mathbb{R}_f: [-2, +\infty)$