

الف) $x^3 - 3x^2 + 3x \Rightarrow R_f = \mathbb{R}$ ب) $(x+1)^3 + 1 \Rightarrow y-1 = (x+1)^3 \rightarrow x = \sqrt[3]{y-1} + 1$	1
الف) $y = \frac{1}{x^2 - 2x} \Rightarrow yx^2 - 2xy = 1 \Rightarrow yx^2 - 2xy - 1 = 0 \Rightarrow \Delta = 4y^2 - 4(-1)(y) = 4y^2 + 4y$ $4y^2 + 4y \geq 0 \Rightarrow y(y+1) \geq 0 \Rightarrow y \in (-\infty, -1] \cup [0, +\infty)$	2
الف) $y = x^2 - 4x + 1 \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{4 \pm \sqrt{16 - 4}}{2} = 2 \Rightarrow R_f = [1, +\infty)$ ب) $y = -2x^2 + 4x + 3 \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-4 \pm \sqrt{16 - 4(-2)}}{-4} = 1 \Rightarrow R_f = (-\infty, 11]$ ج) $y = \sqrt{x^2 - 4x - 3} \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{4 \pm \sqrt{16 - 4(-3)}}{2} = 2 \Rightarrow R_f = [-1, +\infty)$ د) $y = \sqrt{4x - 2x^2} \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-4 \pm \sqrt{16 - 4(-2)}}{-4} = 1 \Rightarrow R_f = [0, 2]$	3
الف) $y = x^3 - 3x^2 + 3x + 1 \quad R_f = \mathbb{R}$ ب) $y = x^4 - 4x^3 + 6x^2 + 4 \quad R_f = \mathbb{R}$ ج) $y = \sqrt{x^4 - 4x^3 + 6x^2 + 4} \quad R_f = [0, +\infty)$ د) $y = (\underbrace{x^4 - 4x^3 + 6x^2 + 4}_{\mathbb{R}})^2 \quad R_f = [0, +\infty)$	4
الف) $y = \frac{x+1}{x-1} \quad -1 \neq 1, 1 \neq 0 \Rightarrow R_f = \mathbb{R} - \{1\}$ ب) $y = \frac{x+1}{x+1} \quad 1 \neq 1, 1 \neq 0 \Rightarrow R_f = \mathbb{R} - \{1\}$	5
الف) $y = \sqrt{\frac{x+1}{x+1}} \quad 1 \neq 1, 1 \neq 0 \Rightarrow R_f = [0, +\infty) - \{1\}$ ب) $y = \sqrt{\frac{x+1}{x-1}} \quad 1 \neq 1, -1 \neq 0 \Rightarrow R_f = [0, +\infty) - \{1\}$	5

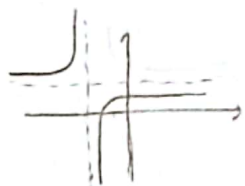
$$الف) y = \frac{x-3}{x+1}$$

$$x+1 > 0$$



$$ب) y = \frac{x-1}{x+2}$$

$$x+2 > 0$$



مقابلتي قائم $x = 1$ = اليمين

مقابلتي قائم $y = 2$ = اليمين

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مقابلتي قائم $x = -2$

مقابلتي قائم $y = 2$

6

$$الف) y = \sin x + \frac{1}{\sin x} \Rightarrow 1 \leq \sin x \leq 1 \Rightarrow R_f = (-\infty, -2] \cup [2, +\infty)$$

$$ب) y = \frac{x^2+1}{x^2} \Rightarrow x^2 + \frac{1}{x^2} \Rightarrow R_f = (-\infty, 2] \cup [2, +\infty)$$

$$ج) \sqrt[3]{x^2+1} \Rightarrow \sqrt[3]{x^2} \neq 0 \Rightarrow R_f = (-\infty, -1] \cup [1, +\infty)$$

$$د) \sqrt{x} + \frac{1}{\sqrt{x}} \Rightarrow R_f = [2, +\infty)$$

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7

$$الف) y = \frac{x^2+1}{x^2+3} \rightarrow x^2 \rightarrow \min = 0 \Rightarrow 0 + \frac{1}{3} = \frac{1}{3} \Rightarrow R_f = [\frac{1}{3}, +\infty)$$

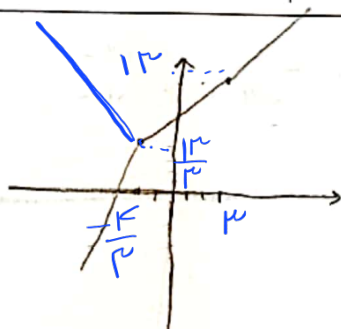
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$$ب) y = \frac{x^2+0}{x^2+5} \rightarrow x^2 \rightarrow \min = 0 \Rightarrow \frac{0}{5} = 0 \Rightarrow R_f = [0, +\infty)$$

$$y = |x-2| + |x+3|$$

$$\begin{cases} -5x-1 & x < -\frac{5}{2} \\ 2x+1 & -\frac{5}{2} < x < 2 \\ 5x+1 & x > 2 \end{cases}$$



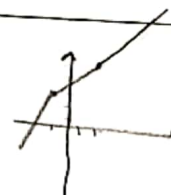
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$$الف) y = |x-1| + |x+2|$$

1

$$\begin{cases} -3x & x < -1 \\ x+2 & -1 \leq x \leq 2 \\ 3x & x > 2 \end{cases}$$



$$ب) y = |x-2| - |x+1|$$

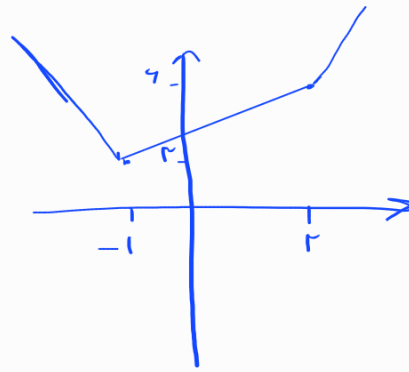
$$\begin{cases} -x-1 & x < -1 \\ -3x+1 & -1 \leq x < 2 \\ x-3 & x > 2 \end{cases}$$



10

$$\begin{array}{c|c|c} -1 & & 2 \\ \hline -\sqrt{2} & 2+\sqrt{2} & \sqrt{2} \end{array}$$

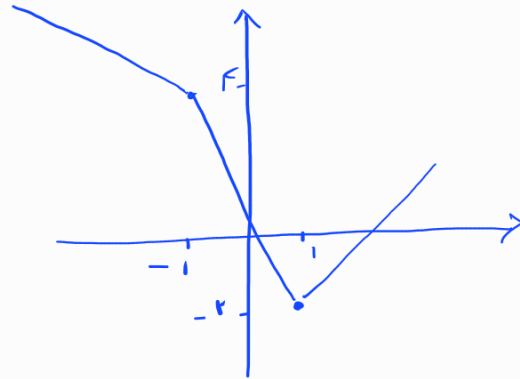
$$R = [\sqrt{2}, +\infty)$$



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$$\begin{array}{c|c|c} -1 & & 1 \\ \hline -2+\sqrt{2} & -\sqrt{2}+1 & 2-\sqrt{2} \end{array}$$

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



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