

الف) $y = \frac{|x| + 1}{|x| - 2}$

$y|x| - 2y = |x| + 1$

$(y-1)|x| = 2y+1$

$|x| = \frac{2y+1}{y-1}$

$\frac{-\frac{1}{2}}{\frac{1}{4} - \frac{1}{4} +}$

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

ب) $y = \frac{x^2 + 1}{|x|} = |x| + \frac{1}{|x|}$

$\Rightarrow R_f = [2, \infty)$

$y = \frac{x^2 + 2x - 2}{x + 3}$

$R_f = (-\infty, -9] \cup [-2, \infty)$

$x^2 + 2x - 2 = y(x + 3)$

$x^2 + (2-y)x - 2-3y = 0 \Rightarrow x = \frac{-b \pm \sqrt{\Delta}}{2a} \Rightarrow \Delta \geq 0$

$\Delta \geq 0 \Rightarrow b^2 - 4ac$

$(2-y)^2 - 4(-2-3y) \geq 0 \Rightarrow \frac{-y-2}{4} - \frac{-2}{4} +$

$y^2 + 8y + 12 \geq 0 \Rightarrow (y+2)(y+6)$

$f(x) = \frac{x^2 - x + \frac{1}{x}}{x^2 - x + 1} \sim \Delta < 0$

$\Rightarrow D_f = \mathbb{R}$

$y x^2 - y x + y = x^2 - x + \frac{1}{x}$

$(1-y)x^2 - (y-1)x + \frac{1}{x} - y$

$R_f = [0, 1)$

$\Delta \geq 0 \Rightarrow b^2 - 4ac = (y-1)^2 - 4(1-y)(\frac{1}{x} - y)$

$= y^2 - 2y + 1 - 4(\frac{1}{x} - y)(1-y)$

$= y^2 - 2y + 1 - 4(\frac{1}{x} - y)(1-y)$

$y(-y+1) = \frac{0}{4} + \frac{1}{4} -$

الف) $y = \sqrt{-x^2 + 4x - 1}$

$\frac{x}{y} = \frac{b}{a} = 2$

$\frac{y}{x} = \frac{a}{b} = \frac{1}{2}$

$\Rightarrow R_f = [0, \sqrt{3}]$

ب) $y = \sqrt{2x^2 - 12x}$

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

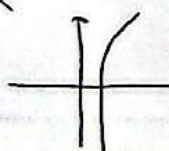
$y_{min} = \frac{a}{b} = -12 \Rightarrow R_f = [12, \infty)$

$R_f = [-2, \infty)$

الف) $y = \log(x^2 - x + 1)$

$R_f = (-\infty, +\infty)$

$\log \mathbb{R}$



ب) $y = \log\left(\frac{x^2 + 1}{x}\right)$

$\frac{x^2 + 1}{x} > 0 \Rightarrow$

$R_f \Rightarrow [2, \infty)$

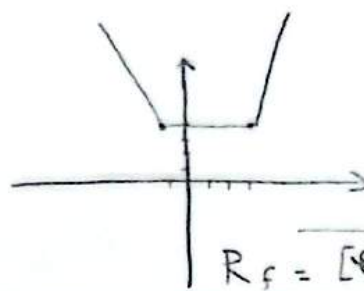
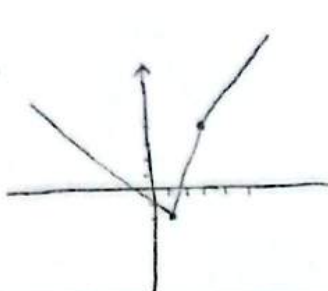
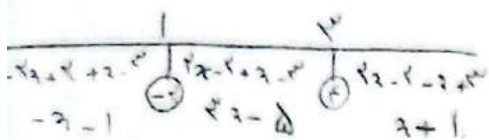
$\log 1 = 0$

$\Rightarrow R_f = [1, \infty)$

بدنه نهای

$$الف) y = |x-2| - |x-3|$$

$$\rightarrow y = |x-2| + |x+1|$$

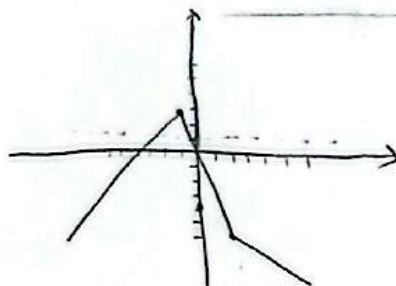
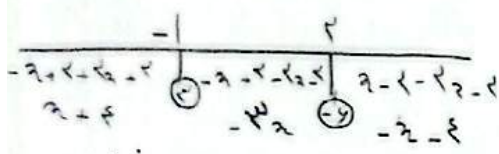


$$R_f = [-1, +\infty)$$

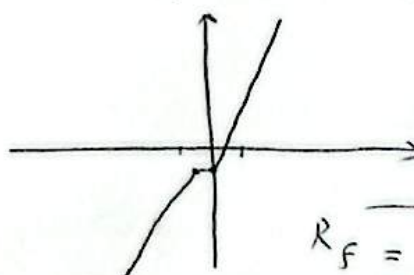
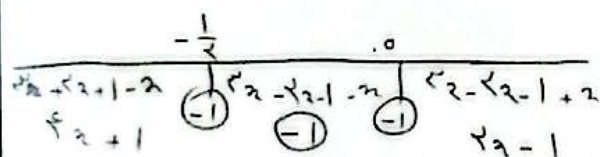
$$R_f = [1, +\infty)$$

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

$$R_f = (-\infty, -\frac{1}{2}] \cup [-\frac{1}{2}, +\infty)$$



$$y = |x-2| + |x+1| + |x|$$

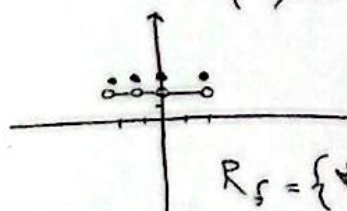


$$R_f = \mathbb{R}$$

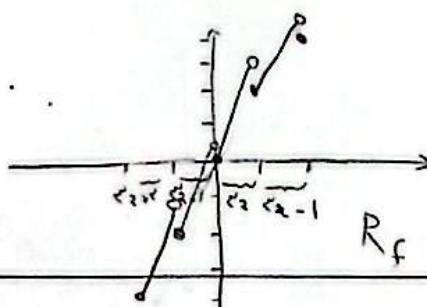
$$ج) y = [x] + [x-2] = [x] + [-x] + 2$$

$$\rightarrow y = 2x - [x]$$

$$[x] + [-x] = \begin{cases} x \in \mathbb{Z} = 0 \\ x \notin \mathbb{Z} = -1 \end{cases}$$



$$R_f = \{0, -1\}$$



$$R_f = [-1, 1]$$

$$د) y = \sin^2 x - \sin x + 1$$

$$\rightarrow y = \sin^2 x + \sin^2 x + 1$$

$$\rightarrow \begin{cases} \max \rightarrow 1 = 1 \\ \min \rightarrow -1 = \frac{1}{2} \\ -\frac{b}{2a} = \frac{1}{2} = \frac{1}{2} \end{cases}$$

$$R_f = [\frac{1}{2}, 1]$$

$$\sin^2 x = t \quad t \in [0, 1]$$

$$\begin{cases} \max \rightarrow 1 \\ \min \rightarrow 0 \\ -\frac{b}{2a} = -\frac{1}{2} \notin [0, 1] \end{cases}$$

$$R_f = [1, 1]$$