

الف) $|x| \leq t \Rightarrow y(t-t) = t+1 \Rightarrow t = \frac{ty+1}{y-1} \geq 0$
 $\Rightarrow \frac{-\frac{1}{y}}{+1-\frac{1}{y}} \Rightarrow R_f = (-\infty, -\frac{1}{y}] \cup [\frac{1}{y}, +\infty)$

ب) $|x| + \frac{1}{|x|} \Rightarrow [1, +\infty)$

$yx + ty = x^2 + tx - t \Rightarrow x^2 + (t-y)x - t - ty$

$\Delta \geq 0 \Rightarrow (y-t)^2 + 4(t+ty) \geq 0 \Rightarrow y^2 + 4ty + 4t^2 \geq 0$

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

$f(x) = \frac{(x-\frac{1}{y})^2}{x^2 - x + 1} = y \Rightarrow D_f = \mathbb{R}$

$x^2(y-1) - (y-1)x + y - \frac{1}{y} = 0$

$\Rightarrow \Delta \geq 0 \Rightarrow (y-1)^2 - 4(y-1)(y-\frac{1}{y}) \geq 0 \Rightarrow R_f = [0, 1)$

الف) $\sqrt{(-\infty, 1]} \rightarrow R_f = [0, \sqrt{e}]$

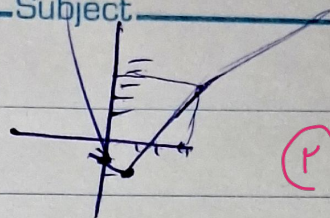
ب) $\sqrt{[-1, +\infty)} \Rightarrow R_f = [-1, +\infty)$

الف) $\log^{\mathbb{R}} \Rightarrow \mathbb{R} \Rightarrow \mathbb{R}$

ب) $x + \frac{1}{x} \xrightarrow{\log_e} [-\infty, -1] \cup [1, +\infty) \xrightarrow{\log_e} [1, +\infty)$

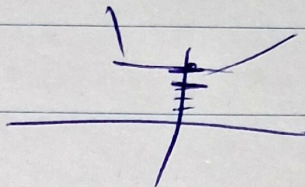
$\Rightarrow R = [1, +\infty)$

الف) $(1, -1), (0, -1)$
 $(2, 4), (4, 4)$



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

ب) $R_f = [4, +\infty)$

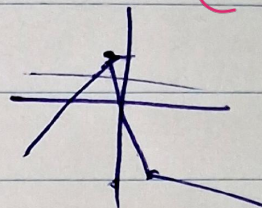


$(2, -1), (-1, 3), (-2, 1), (3, -1)$

$-x + 2 + 2x + 1 = x + 3 = 1 \Rightarrow x = -2$

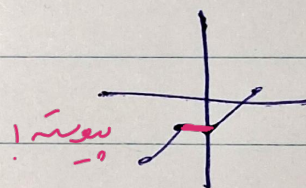
$-x + 2 - 2x - 1 = -3x = 1 \Rightarrow x = -\frac{1}{3}$

$\Rightarrow (-\infty, -2] \cup [-\frac{1}{3}, +\infty)$

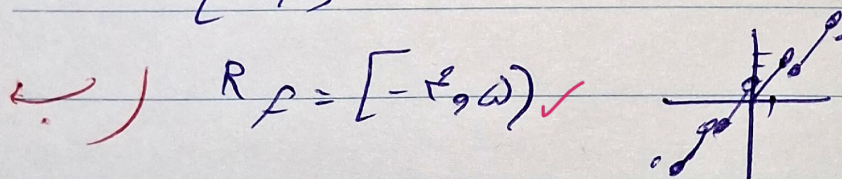


$(-1, -2), (-\frac{1}{3}, -1), (0, -1), (1, 1)$

$R_f = \mathbb{R}$



الف) $y = \underbrace{\begin{bmatrix} x \\ -1 \end{bmatrix}}_{\begin{bmatrix} -1 \\ 0 \end{bmatrix}} + \begin{bmatrix} -x \\ 1 \end{bmatrix} + 2 \Rightarrow \frac{0}{0} \Rightarrow R_f = \{2\}$



ب) $R_f = [-2, \infty)$

الف) $\begin{cases} 1 \rightarrow 1 \\ -1 \rightarrow 2 \\ \frac{1}{2} \rightarrow \frac{3}{2} \end{cases} \rightarrow R_f = [\frac{3}{2}, \infty)$

ب) $\begin{cases} 1 \rightarrow 2 \\ 0 \rightarrow 1 \\ -\frac{1}{2} \rightarrow 0 \end{cases} \rightarrow R_f = [1, \infty)$