

الف) $x = \frac{|u|+1}{|u|-1} \rightarrow |u| = \frac{xy+1}{y-1} \rightarrow \frac{-\frac{1}{y}}{+\frac{1}{y}-\frac{1}{y}} \rightarrow R_f = (-\infty, -\frac{1}{y}] \cup (\frac{1}{y}, +\infty)$ (1) (2)

ب) $y = \frac{u^2+1}{|u|} = |u| + \frac{1}{|u|} \rightarrow R_f = [1, +\infty)$

$y = \frac{u^2+1}{u+1} \rightarrow yu + y = u^2 + u - 1 \rightarrow u^2 + (1-y)u - (1+y) = 0$ (2) (3)

$\rightarrow u = \frac{(y-1) \pm \sqrt{(1-y)^2 + 4(1+y)}}{2} \rightarrow y^2 + 4y + 1 \geq 0 \rightarrow R_f = (-\infty, -4] \cup [-1, +\infty)$

$f(u) = \frac{u^2 - u + \frac{1}{x}}{u^2 - u + 1} \rightarrow yu^2 - yu + y = u^2 - u + \frac{1}{x}$ (2) (3)

$\rightarrow (y-1)u^2 + (1-y)u + (y - \frac{1}{x}) = 0 \rightarrow u = \frac{(y-1) \pm \sqrt{(1-y)^2 - 4(y-1)(y-\frac{1}{x})}}{2y-1}$

$\rightarrow \begin{cases} -4y^2 + 4y > 0 \\ y \neq 1 \end{cases} \rightarrow 0 \leq y \leq 1 \rightarrow R_f = [0, 1)$ $R_f = \mathbb{R}$

الف) $y = \sqrt{-u^2 + 1} - 1 \rightarrow y_{\max} = 0$ $R_f = [0, \sqrt{1}]$ (2) (3)

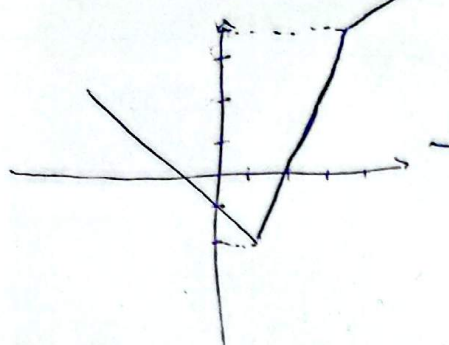
ب) $y = \sqrt{1 - u^2} - 1 \rightarrow y_{\min} = -1 \rightarrow R_f = [-1, +\infty)$

الف) $y = \log(u^2 - u + 1) \rightarrow R = \mathbb{R} \xrightarrow{\log} R_f = \mathbb{R}$ (2) (3)

ب) $y = \log_r(\frac{u^2+1}{u}) \rightarrow R(\frac{u^2+1}{u}) = (-\infty, -1] \cup [1, +\infty) \xrightarrow{\log_r} R_f = [1, +\infty)$

$$y = |u-2| - |u-3|$$

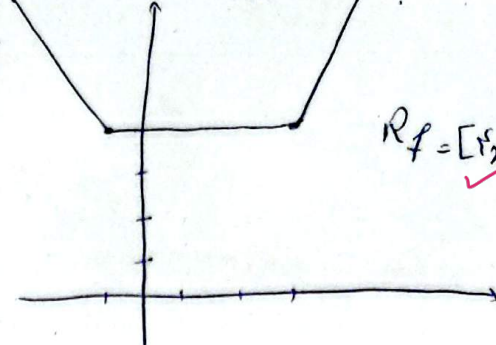
(الف)



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

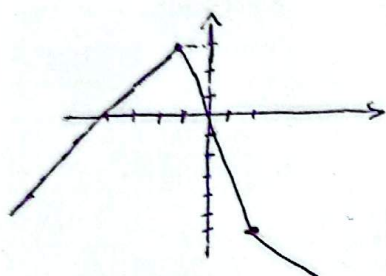
$$y = |u-2| + |u+1|$$

(ب)



$$R_f = [3, +\infty)$$

$$|u-2| - |u+2| \leq 1 \rightarrow u \in [2, -\frac{1}{2})$$



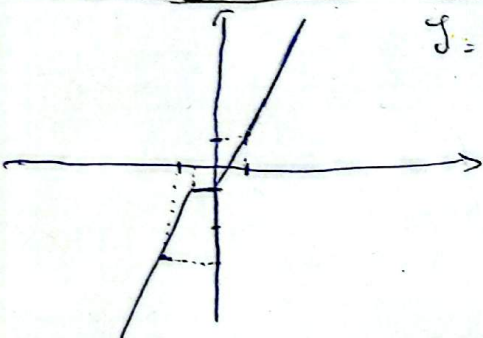
$$\begin{aligned} u+2 < 1 & \quad | -2u+1 | - u-2 \leq 1 \\ u < -3 & \quad u > -\frac{1}{2} \quad u \geq 0 \end{aligned}$$

$$\rightarrow R_f = (-\infty, -\frac{1}{2})$$

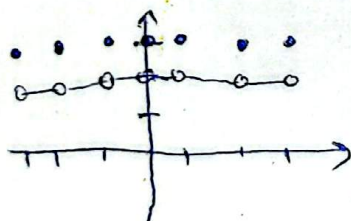
$$y = 3u - |u+1| + |u|$$

$$\begin{aligned} & \frac{-\frac{1}{2}}{u+1} \quad \frac{0}{u-1} \\ & \frac{1}{u+1} \quad -1 \quad \frac{1}{u-1} \end{aligned}$$

$$\rightarrow R_f = \mathbb{R}$$



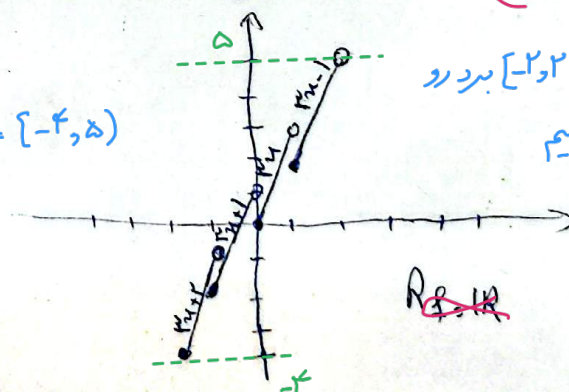
$$\text{الف) } y = [u] + [2-u] = [u] + [-u] + 2$$



$$R_y = \{2, 3\}$$

$$\text{ب) } y = 3u - [u]$$

$$R_y = [-4, 5)$$



تعداد [2, 2] بردار
رغواستیم

$$R_f = \mathbb{R}$$

$$\text{الف) } y = \sin^2 u - \sin u + 1 \rightarrow \begin{cases} \sin u = 1 \rightarrow y = 1 \\ \sin u = -1 \rightarrow y = 3 \\ \sin u = \frac{1}{2} \rightarrow y = \frac{3}{4} \end{cases}$$

$$\rightarrow R_f = [\frac{3}{4}, 3]$$

$$\text{ب) } y = \sin^2 u + \sin u + 1 \rightarrow \begin{cases} \sin u = 0 \rightarrow y = 1 \\ \sin u = 1 \rightarrow y = 3 \\ \sin u = -\frac{1}{2} \rightarrow y = \frac{3}{4} \end{cases}$$

$$\rightarrow R_f = [1, 3]$$