

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

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

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

$\rightarrow x = \frac{(y-2) \pm \sqrt{(2-y)^2+4(2+2y)}}{2} \rightarrow y^2+4y+12 \geq 0$

$\rightarrow R_f = (-\infty, -7] \cup [-2, +\infty)$

$f_{(n)} = \frac{x^2-x+\frac{1}{2}}{x^2-x+1} \rightarrow yx^2-yx+y = x^2-x+\frac{1}{2}$

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

$\rightarrow \begin{cases} -4y^2+4y \geq 0 \\ y \neq 1 \end{cases} \rightarrow 0 < y < 1 \rightarrow R_f = (0, 1) \quad D_f = \mathbb{R}$

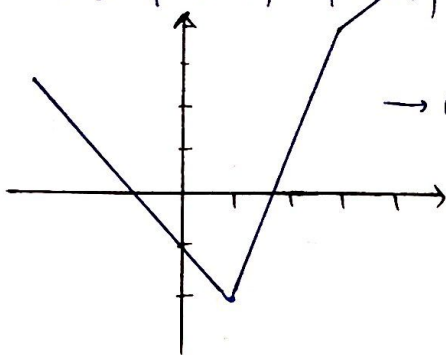
الف) $y = \sqrt{-x^2+2x-1} \rightarrow y_{\max} = 1 \rightarrow R_f = [0, 1]$

ب) $y = \sqrt{2x^2-4x} \rightarrow y_{\min} = -1 \rightarrow R_f = [-1, +\infty)$

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

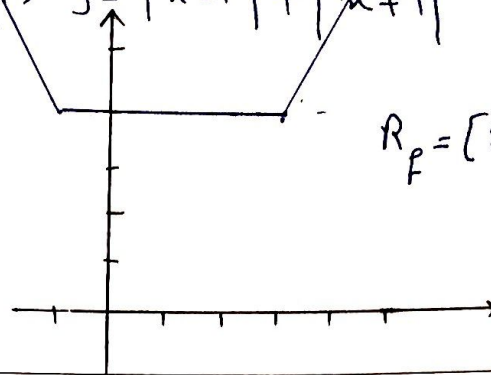
ب) $y = \log_r\left(\frac{x^2+1}{x}\right) \rightarrow R_{\left(\frac{x^2+1}{x}\right)} = (-\infty, -1] \cup [1, +\infty) \xrightarrow{\log} R_f = [1, +\infty) \cup (-\infty, -1]$

الف) $y = |x-2| - |x-3|$



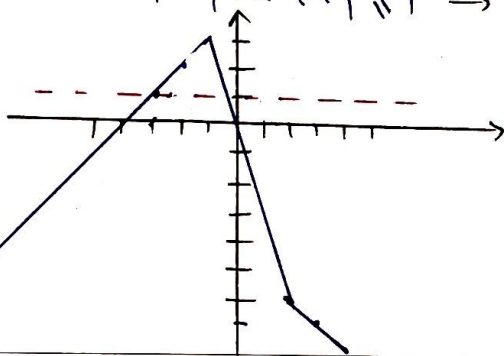
$\rightarrow R_f = [-2, +\infty)$

ب) $y = |x-3| + |x+1|$



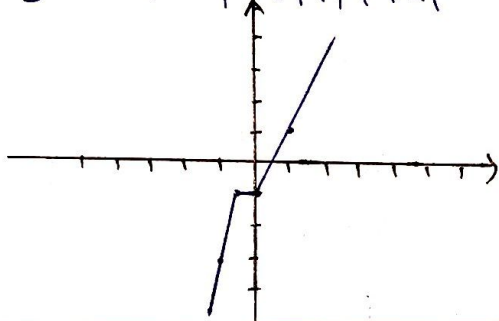
$R_f = [2, +\infty)$

$|x-2| - |x+2| \leq 1 \rightarrow x \in \mathbb{R} - (-2, -\frac{1}{2})$



$$\begin{array}{c} -1 \qquad \qquad \qquad 2 \\ x+2 \leq 1 \mid -3 \leq x \leq 1 \mid -x-2 \leq 1 \\ x \leq -3 \qquad \qquad x \geq -\frac{1}{2} \qquad x \geq 2 \\ \checkmark \qquad \qquad \qquad \checkmark \qquad \qquad \checkmark \\ \rightarrow \mathbb{R} - (-2, -\frac{1}{2}) \end{array}$$

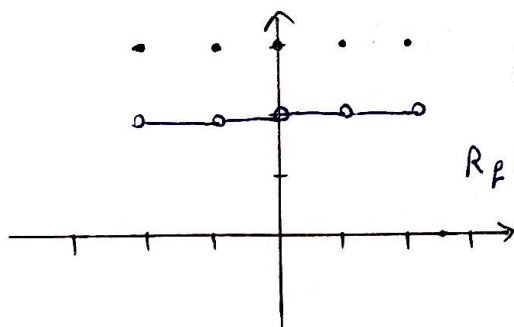
$y = 3x - |x+1| + |x|$



$\frac{-1}{2} \quad 0 \quad 1$

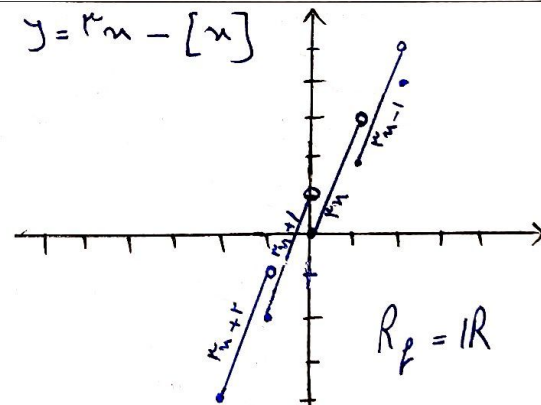
$\rightarrow R_f = \mathbb{R}$

$y = [x] + [3-x] = [x] + [-x] + 3$



$R_f = \{3, 2\}$

$y = 3x - [x]$



$R_f = \mathbb{R}$

الف) $y = \sin^2 x - \sin x + 1$

$$\begin{cases} \sin x = 1 \rightarrow y = 1 \\ \sin x = -1 \rightarrow y = 3 \\ \sin x = \frac{1}{2} \rightarrow y = \frac{5}{4} \end{cases} \rightarrow R_f = [\frac{5}{4}, 3]$$

ب) $y = \sin^2 x + \sin x + 1$

$$\begin{cases} \sin^2 x = 0 \rightarrow y = 1 \\ \sin^2 x = 1 \rightarrow y = 3 \\ \sin^2 x = \frac{1}{4} \rightarrow y = \frac{5}{4} \end{cases} \rightarrow R_f = [1, 3]$$