

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

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

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

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

$f_{(n)} = \frac{x^2 - x + \frac{1}{2}}{x^2 - x + 1} \rightarrow yx^2 - yx + y = x^2 - x + \frac{1}{2}$
 $\rightarrow (y-1)x^2 + (1-y)x + (y-\frac{1}{2}) = 0 \rightarrow x = \frac{(y-1) \pm \sqrt{(1-y)^2 - 4(y-1)(y-\frac{1}{2})}}{2y-2}$
 $\rightarrow \begin{cases} -3y^2 + 4y \geq 0 \rightarrow 0 \leq y \leq 1 \\ y \neq 1 \end{cases} \rightarrow R_f = [0, 1) \quad D_f = \mathbb{R}$

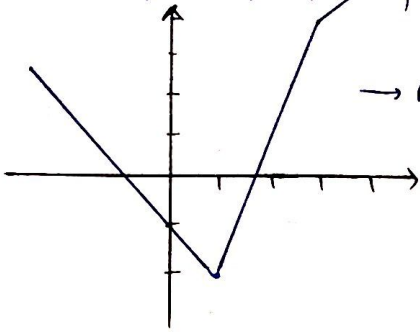
الف) $y = \sqrt{-x^2 + 2x - 1} \rightarrow y_{\max} = 2 \rightarrow R_f = [0, \sqrt{2}]$

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

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

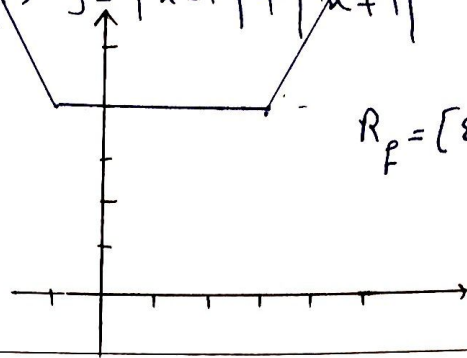
ب) $y = \log_r\left(\frac{x^2+1}{x}\right) \rightarrow R_{\left(\frac{x^2+1}{x}\right)} = (-\infty, -2] \cup [2, +\infty) \xrightarrow{\log} R_f = [1, +\infty) \cup 5$

الف) $y = |x-2| - |x-3|$



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

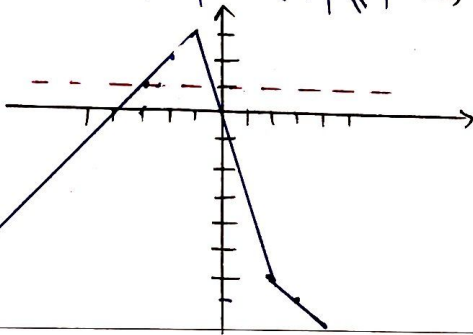
ب) $y = |x-2| + |x+1|$



$R_f = [1, +\infty)$

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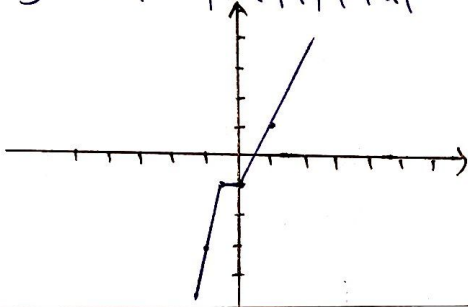
$|x-2| - |x+2| \leq 1 \rightarrow x = \mathbb{R} - (-\frac{1}{2}, \frac{1}{2})$



$x + 2 \leq 1$	$-x \leq 1$	$-x - 2 \leq 1$
$x \leq -1$	$x \geq -\frac{1}{2}$	$x \geq 3$
✓	✓	✓

$\rightarrow \mathbb{R} - (-\frac{1}{2}, \frac{1}{2})$

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

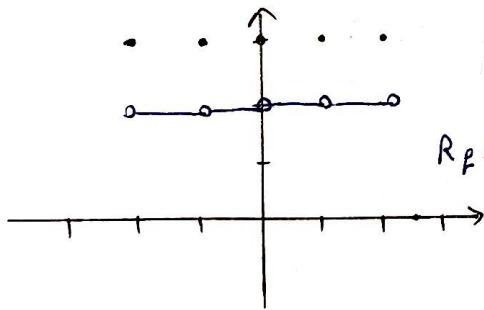


$\frac{-1}{x+1} \quad -1 \quad x-1$

$\rightarrow R_f = \mathbb{R}$

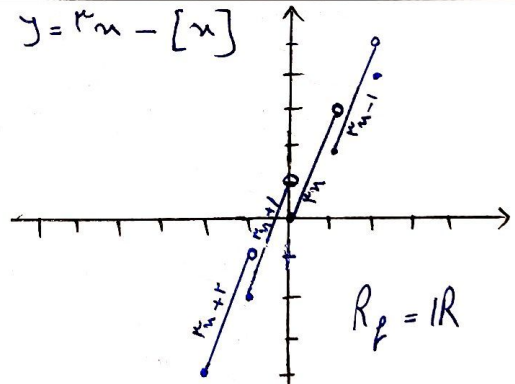
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$y = [x] + [x-1] = [x] + [-x] + 1$



$R_f = \{1, 1\}$

$y = 3x - [x]$



$R_f = \mathbb{R}$

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الف) $y = \sin^2 x - \sin x + 1$

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

ب) $y = \sin^2 x + \sin x + 1$

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

1.