

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

$$\Delta \geq 0 \rightarrow (1-y)^2 - 4(y+2) \geq 0 \rightarrow y^2 - 6y - 7 \geq 0$$

$$R_f = (-\infty, -1] \cup [7, +\infty)$$


الف) $2x^2 - 5x + 1$ $\rightarrow R_f = [-\frac{5}{4}, +\infty)$

ب) $-\frac{\Delta}{4a} = -\frac{19}{4} \rightarrow R_f = [-\frac{19}{4}, +\infty)$

ج) $\sqrt{-x^2 + 6x - 5}$ $\rightarrow R_f = [0, \sqrt{\frac{\Delta}{4a}}] = [0, 2]$

د) $\sqrt{x^2 - 2x^2 + 4x + 1}$ $\rightarrow R_f = [0, +\infty)$

ه) $\log(x^2 - 5x^2 + 7x + 4)$ $\rightarrow R_f = R$

الف) $\frac{3x+1}{2x-5} \rightarrow R_f = R - \{\frac{5}{2}\} = R - \{F\}$

ب) $y = \sqrt{\frac{4x+1}{x-2}} \rightarrow y^2 = \frac{4x+1}{x-2} \rightarrow x = \frac{2y^2+1}{y^2-4} \rightarrow y \neq 2 \rightarrow R_f = [0, +\infty) - \{2\}$

ج) $y = \frac{x^2+2x+1}{\sqrt{x^2+4x}} = \sqrt{x^2+4x} + \frac{1}{\sqrt{x^2+4x}} \rightarrow \sqrt{x^2+4x} \geq \sqrt{4} \rightarrow y_{min} = \frac{5}{2}\sqrt{2}$

د) $x^2 + \frac{1}{x^2+4} - 4 \rightarrow x^2 + 4 \geq 4 \rightarrow y_{min} = \frac{1}{4}$

$R = [\frac{1}{4}, +\infty)$

$\frac{3x^2+5x}{x^2-1} \rightarrow x^2 = \frac{y+4}{y-3} \rightarrow R = [\frac{1}{4}, +\infty)$

$\rightarrow R = (-\infty, -4] \cup (3, +\infty)$

حل: $y^2 \geq 0 \rightarrow \begin{cases} x^2 = 0 \rightarrow y = 4 \\ x^2 = +\infty \rightarrow \lim_{x \rightarrow \infty} \frac{3x^2+5x}{x^2-1} = 3 \end{cases}$

$\rightarrow R_f = (-\infty, -4] \cup (3, +\infty)$

$y = \frac{2\sin x - 1}{\sin x + 2} \rightarrow \sin x = \frac{y+1}{2-y} \rightarrow 1 \geq \frac{y+1}{2-y} \geq -1$

$\rightarrow R_f = [-\frac{3}{4}, \frac{1}{2}]$

حل: $-1 \leq \sin x \leq 1 \rightarrow \sin x = 1 \rightarrow y = \frac{1}{3}$

$\rightarrow \sin x = -1 \rightarrow y = -\frac{3}{4}$

$\rightarrow R_f = [-\frac{3}{4}, \frac{1}{3}]$

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$$\frac{x^2 - x + \frac{1}{4}}{x^2 - x + 1} \rightarrow x^2 - x + 1 \neq 0 \rightarrow \Delta < 0 \rightarrow \boxed{DF = R}$$

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الف) $|2x - 2| - |x - 3|$

$-x - 1 \mid x - 2 \mid x + 1$
 $\rightarrow R = [-2, +\infty)$

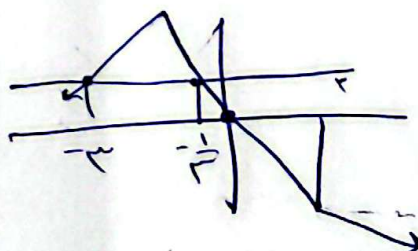
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ب) $|x - 3| + |x + 1|$

$\rightarrow R = [2, +\infty)$

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

$$-x - 2 \mid -x - 2 \mid -x - 2$$



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

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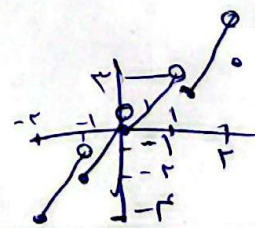
الف) $\begin{cases} x \in \mathbb{Z} \\ y \notin \mathbb{Z} \end{cases}$



ب) $3x - [x]$

$$\begin{cases} 2 \leq x < 3 & RF = \{2, 3\} \\ 1 \leq x < 2 & RF = \{1, 2\} \\ 0 \leq x < 1 & RF = \{0, 1\} \\ -1 \leq x < 0 & RF = \{-1, 0\} \\ x = 2 & RF = \{2\} \end{cases}$$

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



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$$y = \sin^2 t - \sin t + 1 \rightarrow y = t^2 - t + 1 \rightarrow \min = \frac{1}{4}$$

$$\sin t \rightarrow y_{\max} = 2 \rightarrow y_{\min} = \frac{3}{4} \rightarrow R = [\frac{3}{4}, 2]$$

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

$$\begin{cases} t = -\frac{1}{2} \rightarrow y_{\max} = \frac{5}{4} \\ t = 0 \rightarrow y_{\min} = 1 \end{cases} \rightarrow R = [1, \frac{5}{4}]$$