

(ب) $x > 0 \rightarrow x + \frac{1}{x} \geq 2$ $x < 0 \rightarrow -x - \frac{1}{x} \geq 2$ $\rightarrow R_f = [2, +\infty)$	(الف) $1 + \frac{2}{ x -2} \rightarrow 0 < x < 2$ $\rightarrow y \in (-\infty, -\frac{1}{2}]$ $ x \geq 2 \rightarrow y \in (1, +\infty)$ $\rightarrow R_f = (-\infty, -\frac{1}{2}] \cup (1, +\infty)$
$xy + 2y = x^2 + 2x - 2 \rightarrow x^2 + (2-y)x - (2+2y) = 0$ $\rightarrow \Delta \geq 0 \rightarrow (2-y)^2 - 4 \times 1 \times (-2-2y) \geq 0 \rightarrow (y+4)(y+2) \geq 0$ $y \quad -4 \quad -2$ $\uparrow \quad \downarrow \quad \uparrow$ $\rightarrow R_f = \mathbb{R} - (-4, -2)$	۲
$\left. \begin{array}{l} x^2 - x + 1 \leq 0 \\ \Delta < 0 \end{array} \right\} D_f = \mathbb{R}$ $x^2 - x + t \rightarrow \frac{t+1/4}{t+1}$ $t_{\min} = -1/4$ $\rightarrow R_f = [0, 1)$	۳ $\begin{array}{l} t \rightarrow +\infty \rightarrow y \leq 1 \\ t \rightarrow -1/4 \rightarrow y \geq 0 \end{array}$
(ب) $x_{\min} \leq 2 / y_{\min} \leq -1$ $\rightarrow R_f = [-2, +\infty)$	(الف) $x_{\min} \leq 2 / y_{\min} \leq 2$ $\rightarrow R_f = [0, \sqrt{3}]$
(ب) $\frac{x^2+1}{x} = x + \frac{1}{x}$ $x \geq 0 \rightarrow x + \frac{1}{x} \geq 2$ $\rightarrow R_f = [1, +\infty)$	(الف) $x^3 - x + 1 \in \mathbb{R}$ $x^3 - x + 1 \geq 0 \checkmark$ $\rightarrow R_f = \mathbb{R}$

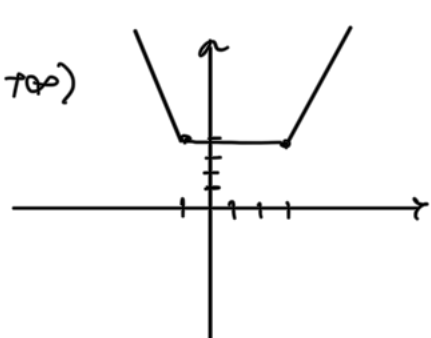
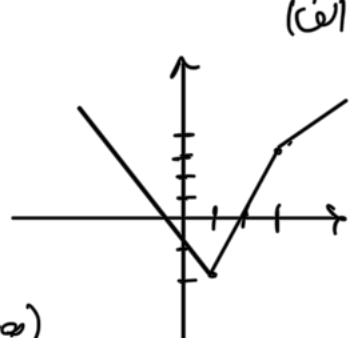
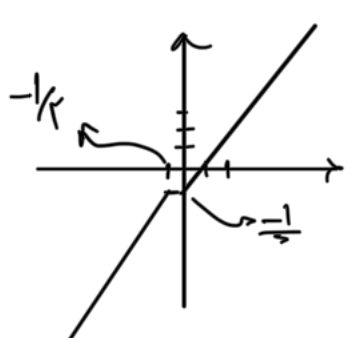
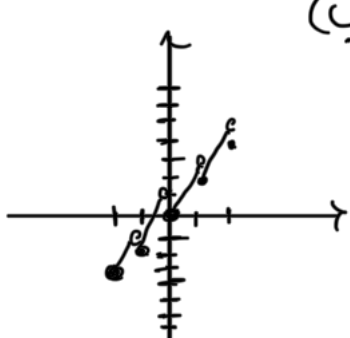
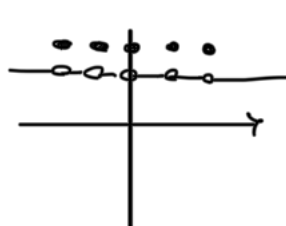
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(ب) $R_f = [1, +\infty)$ 	(الف)  $R_f = [-1, +\infty)$	٦
$x \geq 1 \rightarrow -x - 1 \leq 1 \rightarrow -x - 0 \leq 0 \rightarrow x \leq -0$ $1 > x \geq -1 \rightarrow -1x \leq 1 \rightarrow -1x - 1 \leq 0 \rightarrow x \leq -1/1$ $x < -1 \rightarrow x + 1 \leq 1 \rightarrow x + 1 \leq 0 \rightarrow x \leq -1$ $D = (-\infty, -1] \cup [-1/2, +\infty)$		٧
$x \geq 0 \rightarrow y \leq 1x - 1$ $0 > x \geq -1/2 \rightarrow y \leq -1$ $-1/2 > x \rightarrow y \leq 1x + 1$ $R_f = \mathbb{R}$		٨
(ب) $x \in [-1, -1) \rightarrow y \leq 1x + 1$ $x \in [-1, 0) \rightarrow y \leq 1x + 1$ $x \in [0, 1) \rightarrow y \leq 1x$ $x \in [1, 2) \rightarrow y \leq 1x - 1$ $x = 2 \rightarrow y \leq 1$ $\min R_f = [1, 2)$ $\text{Co} R_f = \mathbb{R}$ 	(الف) $y \in [x] + [-x] \leq 1$ $x \in \mathbb{Z} \rightarrow y \leq 1$ $x \in \mathbb{Z} \rightarrow y \leq 1$ $R_f = \{1, 2\}$ 	٩
(ب) $\sin x \leq t \rightarrow t + t + 1 = y$ $\rightarrow 0 \leq t \leq 1 \rightarrow t \leq 0 \rightarrow y \leq 1$ $\rightarrow t \leq 1 - t \rightarrow y \leq 1$ $\rightarrow t_{\min} = -1/4 \rightarrow y \leq 1$ $R_f = [1, 2]$	(الف) $\sin x \leq -1 \rightarrow y \leq 1$ $\sin x \leq 1 \rightarrow y \leq 1$ $\sin x_{\min} \leq 1/4 \rightarrow y \leq 1/4$ $\rightarrow R_f = [1/4, 2]$	١٠