

الف) $|x| = t \Rightarrow y(t-2) = t+1 \Rightarrow t = \frac{2y+1}{y-1}$
 $\frac{2y+1}{y-1} \geq 0 \rightarrow \frac{1}{1-\frac{1}{y}} \Rightarrow R = (-\infty, \frac{1}{2}] \cup (1, +\infty)$

ب) $x^2 = |x|^2 \rightarrow |x| = t \Rightarrow y = \frac{t^2+1}{t} \Rightarrow y = t + \frac{1}{t} \rightarrow t + \frac{1}{t} \geq 2$
 $\rightarrow R = [2, +\infty)$

$\rightarrow y = \frac{(x+3)(x-1)+1}{x+3} \Rightarrow y+1 = x + \frac{1}{x+3} \rightarrow t = x+3$
 $y+1 = t + \frac{1}{t} \Rightarrow t + \frac{1}{t} \geq 2 \quad \vee \quad t + \frac{1}{t} \leq -2$
 $\Rightarrow y \geq -2, y \leq -4 \Rightarrow R = (-\infty, -4] \cup [-2, +\infty)$

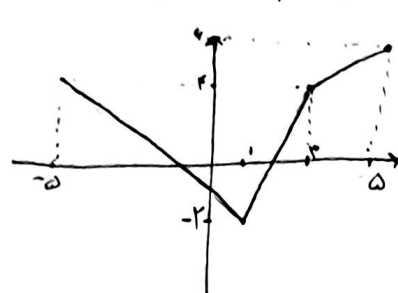
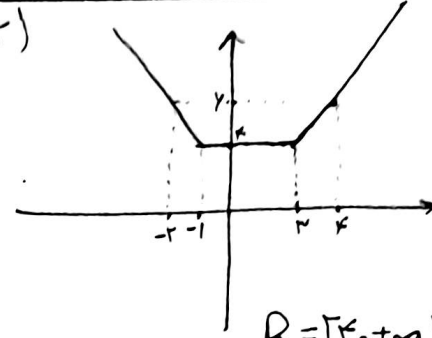
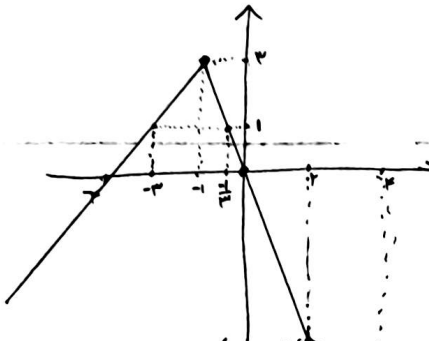
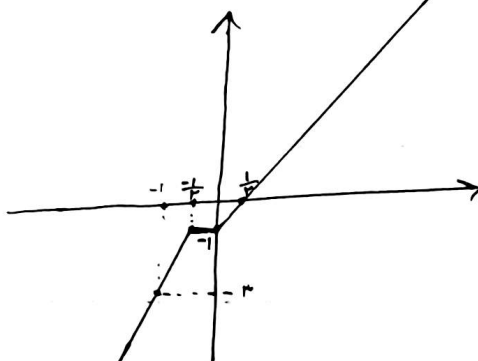
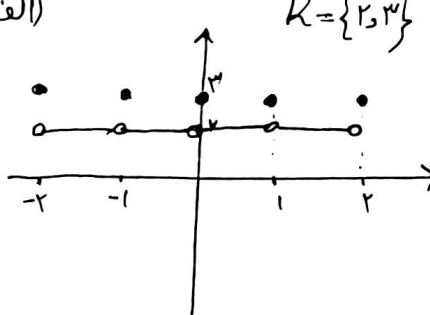
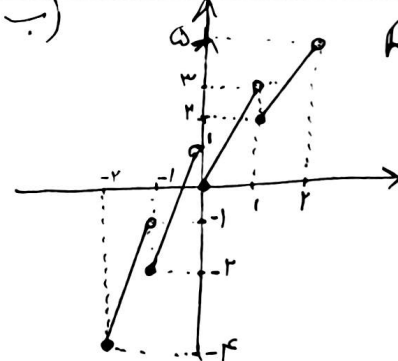
$x^2 - x + 1 \neq 0 \Rightarrow \Delta < 0 \Rightarrow D_f = \mathbb{R}$
 $x \rightarrow +\infty \rightarrow \frac{x^2 - x}{x^2 - x} = 1 \textcircled{1}, x = \frac{-b}{2a} \Rightarrow \frac{-(-1)}{2} = x$
 $\left(\frac{1}{2}\right)^2 - \frac{1}{2} + \frac{1}{2} = \frac{0}{2} = 0 \textcircled{2} \xrightarrow{\textcircled{1}\textcircled{2}} R_f = [0, 1)$
 $\left(\frac{1}{2}\right)^2 - \frac{1}{2} + 1 = \frac{3}{4} \textcircled{3}$

الف) $\rightarrow \sqrt{4-(x-2)^2} \Rightarrow 4-(x-2)^2 \geq 0 \Rightarrow 4-(x-2)^2 \leq 4$
 $0 \leq 4-(x-2)^2 \leq 4 \Rightarrow R = [0, 2]$

ب) $\rightarrow \sqrt[3]{2(x-2)^2-1} \rightarrow (x-2)^2 \geq 0 \Rightarrow 2(x-2)^2-1 \geq -1$
 $\sqrt[3]{-1} = -1 \Rightarrow R = [-1, +\infty)$

الف) $x^3 - x + 1 \geq 0 \rightarrow x \rightarrow +\infty \rightarrow y = +\infty \Rightarrow R = \mathbb{R}$

ب) $\frac{x^2+1}{x} = x + \frac{1}{x} \rightarrow x + \frac{1}{x} \geq 2 \Rightarrow \log_2 2 = 1 \Rightarrow R = [1, +\infty)$

الف) $\rightarrow \frac{-x-1}{x^2-5} \Rightarrow R = [-5, +\infty)$ 	ب) $\rightarrow$  $R = [-1, +\infty)$	6
 $\Rightarrow D_f = (-\infty, -1] \cup [1, +\infty)$		7
 $R = \mathbb{R}$		8
الف) $R = \{1, 3\}$ 	ب) $R = \mathbb{R}$ 	9
الف) $\sin x = 1 \Rightarrow 1 - 1 + 1 = 1$, $\sin x = -1 \Rightarrow 1 + 1 + 1 = 3$ $\sin x = \frac{1}{2} \Rightarrow \frac{1}{2} - \frac{1}{2} + 1 = \frac{1}{2} \Rightarrow R = [\frac{1}{2}, 3]$ ب) $\sin x = 1 \rightarrow 1 + 1 + 1 = 3$, $\sin x = 0 \Rightarrow 0 + 0 + 1 = 1$ $\sin x \neq \frac{1}{2} \Rightarrow R = [1, 3]$		10