

الف) $y = \frac{|x|+1}{|x|-2}$ $\frac{1}{y} \leftarrow \frac{y+1}{y-1} \geq 0$ $R_F = (-\infty, -\frac{1}{2}] \cup (1, +\infty)$ ج.ا

$|x| = t$ $\Rightarrow \frac{t+1}{t-2} \geq 0 \rightarrow t = \frac{y+1}{y-1}$ $t \geq 0$ $|x| = t \rightarrow y = \frac{t^2+1}{t} = t + \frac{1}{t}$ $t > 0$

$a + \frac{1}{a} \geq a \Rightarrow (a, +\infty) \rightarrow R_F = [2, +\infty)$

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

$x^2 + (2-y)x - (2+2y) = 0$

$\Delta \geq 0 \rightarrow (2-y)^2 + 4(2+2y) \geq 0 \rightarrow R_F = (-\infty, -2] \cup [-2, +\infty)$

$\frac{x^2-x+\frac{1}{x}}{x^2-x+1}$ $\rightarrow \frac{x^2-x+\frac{1}{x}}{x^2-x+\frac{1}{x}+\frac{1}{x}} = \frac{(x-\frac{1}{x})^2}{(x-\frac{1}{x})^2+\frac{1}{x^2}} = \frac{a^2}{a^2+\frac{1}{x^2}}$

$\hookrightarrow \Delta < 0 \Rightarrow D_F = \mathbb{R}$ $\hookrightarrow [0, 1)$ $R_F = [0, 1)$

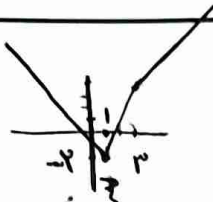
الف) $y = \sqrt{-x^2+4x-1}$ $\rightarrow y = \sqrt{-(x-2)^2+3}$ $\rightarrow R = [0, \sqrt{3}]$

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

$y = \log(x^2-x+1)$ $\rightarrow x^2-x+1 > 0$ $\hookrightarrow R_F = \mathbb{R}$

ج.ا) $\log_p(\frac{x^2+1}{x}) \geq \log_p(x+\frac{1}{x})$ $\rightarrow x+\frac{1}{x} \geq 2$ $\rightarrow R_F = [1, +\infty)$

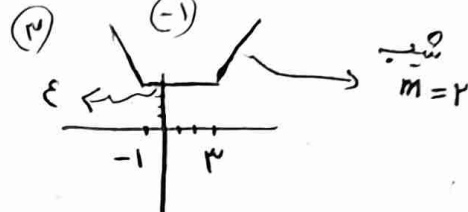
$$y = |m-2| - |m-3|$$



$$\begin{aligned} -m-1 & \quad m < 1 \rightarrow (1, -2) \\ m-2 & \quad 1 \leq m < 3 \rightarrow (2.5, -1) \\ m+1 & \quad m \geq 3 \rightarrow (3, 0) \end{aligned}$$

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

$$y = |m-2| + |m+1|$$



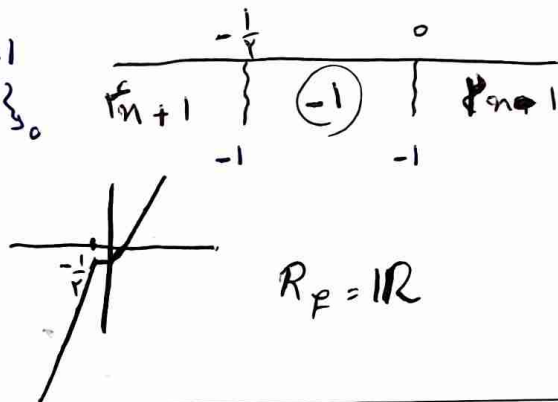
$$R_f = [1, +\infty)$$

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

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

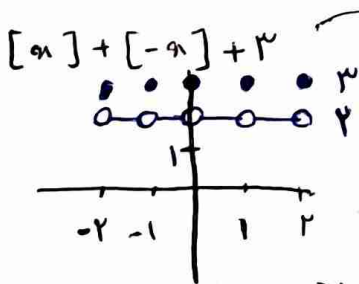
$$\begin{aligned} m < -1 : (2-m) - (-m-2) \leq 1 & \Rightarrow m \leq -2 \\ -1 \leq m < 2 : (2-m) - (m+2) \leq 1 & \Rightarrow -2m \leq 1 \Rightarrow m \geq -\frac{1}{2} \\ m \geq 2 : (m-2) - (m+2) \leq 1 & \Rightarrow -4 \leq 1 \end{aligned}$$

$$y = |m-1| - |m+1| + |m|$$



$$R_f = \mathbb{R}$$

$$y = [m] + [2-m]$$



$$R_f = \{0, 1, 2\}$$

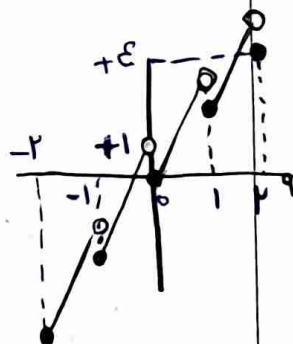
$$\mathbb{Z} \rightarrow [m] + [2-m] = 0$$

$$\mathbb{Z} \rightarrow -1$$

$$y = [m] - [m]$$

$$\begin{aligned} -1 \leq m < 0 & \rightarrow [m] = -1 \\ 0 \leq m < 1 & \rightarrow [m] = 0 \\ 1 \leq m < 2 & \rightarrow [m] = 1 \\ m = 2 & \rightarrow [m] = 2 \end{aligned}$$

$$\begin{aligned} [m+2] & \\ [m+1] & \\ [m] & \\ [m-1] & \\ \varepsilon & \end{aligned}$$



$$y = \sin^2 m - \sin^2 m + 1$$

$$R_f = [1, 1]$$

$$y = \sin^2 m + \sin^2 m + 1$$

$$\begin{aligned} +1 & \rightarrow 2 \\ 0 & \rightarrow 1 \\ -1 & \rightarrow 0 \end{aligned}$$

$$R_f = [1, 2]$$