

الف) $y = x^2 - 5 \rightarrow x^2 = y + 5 \rightarrow x = \pm \sqrt{y+5} \quad y+5 \geq 0 \quad y \geq -5 \rightarrow R_f = [-5, +\infty)$

ب) $y = x^3 + 1 \rightarrow x^3 = y - 1 \rightarrow x = \sqrt[3]{y-1} \rightarrow R_f = \mathbb{R}$

الف) $y = x^2 - 2x + 2 \rightarrow x^2 - 2x + 2 - y = 0 \quad x = \frac{-b \pm \sqrt{\Delta}}{2a} \quad R_f = [1, +\infty)$
 $\Delta \geq 0 \quad 4 - 4(2-y) \geq 0 \Rightarrow 4y - 4 \geq 0 \Rightarrow y \geq 1$

ب) $y = x^2 - 2x + 1 \rightarrow x^2 - 2x + 1 - y = 0 \quad x = \frac{-b \pm \sqrt{\Delta}}{2a}$
 $4 - 4(1-y) \geq 0 \Rightarrow 4y \geq 0 \Rightarrow y \geq 0$
 $R_f = [0, +\infty)$

الف) $y = \frac{x^2 + 3}{x^2 - 1} \quad y(x^2 - 1) = x^2 + 3 \rightarrow x^2(y - 1) = 3y + 3 \Rightarrow x = \pm \sqrt{\frac{3y+3}{y-1}}$
 $\frac{3y+3}{y-1} \geq 0$
 $R_f = (-\infty, -\frac{3}{2}] \cup (1, +\infty)$

ب) $y = \frac{x+1}{x-2} \quad y(x-2) = x+1 \quad |x|(y-2) = 2y+1 \rightarrow |x| = \frac{2y+1}{y-2}$
 $\frac{2y+1}{y-2} \geq 0$
 $R_f = (-\infty, -\frac{1}{2}] \cup (2, +\infty)$

$y = \frac{1}{x^2 - 2x} \quad yx^2 - 2yx - 1 = 0 \quad x = \frac{-b \pm \sqrt{\Delta}}{2a}$
 $\Delta = 4y^2 + 4y \geq 0$
 $\frac{4y^2 + 4y}{4} \geq 0 \Rightarrow y^2 + y \geq 0 \Rightarrow y(y+1) \geq 0$
 $R_f = (-\infty, -\frac{1}{2}] \cup (0, +\infty)$

الف) $y = x^2 - 4x + 2 \quad \min \left| \frac{y}{4} = 3 \right. \quad R_f = [-2, +\infty)$
 $4 - 16 + 2 = -10$

ب) $y = -x^2 + 2x + 2 \quad \max \left| \frac{-y}{1} = 2 \right. \quad R_f = (-\infty, 2]$
 $-4 + 4 + 2 = 2$

$$y = \sqrt{n^2 - 2n} \quad \min \left| \frac{y}{n} = \frac{2}{-1} \right| \rightarrow R_F = \sqrt{[-1, +\infty)} = [0, +\infty) \quad (\text{الف})$$

$$y = \sqrt{-n^2 + 4n + 10} \quad \max \left| \frac{-4}{-2} = 2 \right| \quad 14 \quad (\text{ب})$$

$$R_F = \sqrt{(-\infty, 14]} = [0, \sqrt{14}]$$

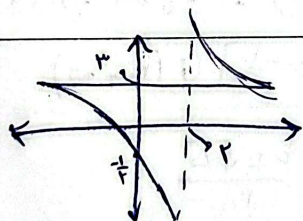
$$y = n^2 + 2n \varepsilon + 2n + 1 \quad \xrightarrow{\text{بیشترین توان از } \varepsilon} R_F = \mathbb{R} \quad (\text{الف})$$

$$y = \sqrt{n^2 + 2n \varepsilon + 4n + 1} \quad R_F = \sqrt{\mathbb{R}} = [0, +\infty) \quad (\text{ب})$$

$$y = \frac{2n+1}{n-2} \quad \xrightarrow{\text{تقسیم}} R_F = \mathbb{R} - \{2\} \quad (\text{الف})$$

$$y = \sqrt{\frac{\varepsilon n + 1}{n + 2}} \quad R_F = \sqrt{\mathbb{R} - \{\varepsilon\}} = [0, +\infty) - \{2\} \quad (\text{ب})$$

$$y = \frac{2n+1}{n-2}$$

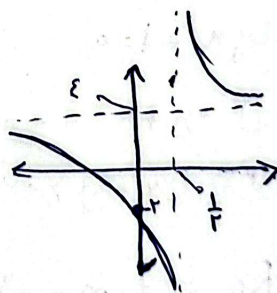


$$n = 80 \quad y = \frac{1}{2}$$

(الف)

$$y = \frac{\varepsilon n - 2}{1 - 2n}$$

$$n = 0 \Rightarrow y = -2$$



(ب)

$$y = \cos^2 n + \frac{1}{\cos^2 n} \Rightarrow R_F = [2, +\infty) \quad (\text{الف})$$

$$y = \sqrt[3]{\frac{n^2 + 1}{n}} = \sqrt[3]{n + \frac{1}{n}} = \sqrt[3]{(-\infty, -2] \cup [2, +\infty)} \Rightarrow$$

$$R_F = (-\infty, \sqrt[3]{-2}] \cup [\sqrt[3]{2}, +\infty)$$