

الف) $y = x^2 - 5 \rightarrow x^2 = y + 5 \rightarrow x = \pm \sqrt{y+5} \rightarrow y+5 \geq 0 \rightarrow y \geq -5 \rightarrow R_f = [-5, +\infty)$	۱
ب) $y = x^2 + 1 \rightarrow x^2 = y - 1 \rightarrow x = \pm \sqrt{y-1} \rightarrow R_f = \mathbb{R}$	
الف) $x^2 - 4x + 4 \rightarrow x^2 - 4x + 4 + 2 \rightarrow (x-2)^2 + 2 = y \rightarrow (x-2)^2 = y - 2 \rightarrow x = \pm \sqrt{y-2} + 2 \rightarrow y - 2 \geq 0 \rightarrow y \geq 2 \rightarrow R_f = [2, +\infty)$	۲
ب) $y = x^2 - 5x + 1 \rightarrow x^2 - 5x + 1 - y = 0 \rightarrow \Delta \geq 0 \rightarrow \Delta = (-5)^2 - 4(1)(1-y) \geq 0 \rightarrow 25 + 4y \geq 0 \rightarrow 4y \geq -25 \rightarrow y \geq -\frac{25}{4} \rightarrow R_f = [-\frac{25}{4}, +\infty)$	
الف) $y = \frac{x^2 + 3}{x - 2} \rightarrow x = \frac{\sqrt{y+3}}{y-1} \rightarrow \begin{cases} y+3 \geq 0 \rightarrow y \geq -3 \\ y-1 \neq 0 \rightarrow y \neq 1 \end{cases} \rightarrow \frac{-3}{1} \leq \frac{1}{y-1} \rightarrow R_f = (-\infty, -\frac{3}{1}] \cup (1, +\infty)$	۳
ب) $y = \frac{2 x+1 }{ x -4} \rightarrow x = \frac{4y+1}{y-2} \rightarrow \begin{cases} 4y+1 \geq 0 \rightarrow y \geq -\frac{1}{4} \\ y-2 \neq 0 \rightarrow y \neq 2 \end{cases} \rightarrow \frac{-\frac{1}{4}}{2} \leq \frac{1}{y-2} \rightarrow R_f = (-\infty, -\frac{1}{4}] \cup (2, +\infty)$	
$y = \frac{1}{x^2 - 4x} \rightarrow yx^2 - 4yx - 1 = 0 \rightarrow \Delta = (-4y)^2 - 4(y)(-1) = 16y^2 + 4y \rightarrow 4y(4y+1) \geq 0$ $4y(4y+1) \geq 0 \xrightarrow{\text{هر دو مثبت}} y \geq 0, y \geq -\frac{1}{4} \Rightarrow R_f = (-\infty, -\frac{1}{4}] \cup (0, +\infty)$ $\xrightarrow{\text{هر دو منفی}} y \leq -\frac{1}{4}, y \leq 0$	۴
الف) $y = x^2 - 4x + 2 \rightarrow a > 0 \rightarrow \min \rightarrow \begin{cases} -\frac{b}{2a} = \frac{4}{2} = 2 \\ 4 - 16 + 2 = -10 \end{cases} \Rightarrow R_f = [-10, +\infty)$	۵
ب) $y = -x^2 + 4x + 2 \rightarrow a < 0 \rightarrow \max \rightarrow \begin{cases} -\frac{b}{2a} = \frac{-4}{-2} = 2 \\ -4 + 16 + 2 = 14 \end{cases} \Rightarrow R_f = (-\infty, 14]$	

الف) $y = \sqrt{x^2 - 4x + 2} \rightarrow a > 0 \rightarrow \min x \rightarrow \left| \frac{-b}{2a} = \frac{2}{2} = 1 \Rightarrow R_f = [1, +\infty)$

ب) $y = \sqrt{-x^2 + 4x + 1} \rightarrow a < 0 \rightarrow \max x \rightarrow \left| \frac{-b}{2a} = \frac{-2}{-2} = 1 \Rightarrow R_f = [0, \sqrt{5}]$

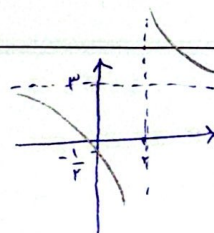
الف) $y = x^4 + 3x^2 + 2x + 1$ $\xrightarrow{\text{برایترین توان فرد است}}$ $R_f = \mathbb{R}$

ب) $y = \sqrt{x^5 + 4x^2 + 4x + 1}$ $\xrightarrow{\text{برایترین توان فرد است}}$ $R_f = [0, +\infty)$

الف) $y = \frac{3x+1}{x-1} \rightarrow R_f = \mathbb{R} - \left\{ \frac{a}{c} \right\} \rightarrow R_f = \mathbb{R} - \{1\}$

ب) $y = \sqrt{\frac{4x+1}{x+3}}$ $\rightarrow R_f = [0, +\infty) - \{1\}$

الف) $\frac{3x+1}{x-1} \rightarrow$ $\begin{aligned} \text{میان افقی: } y &= \frac{a}{c} = 3 \\ \text{میان عمودی: } x &= \frac{b}{d} = 1 \\ x \rightarrow 0 &\rightarrow y = -\frac{1}{1} \end{aligned}$



ب) $y = \frac{4x-2}{1-2x} = \frac{2(2x-1)}{-(2x-1)} = -2$



الف) $y = \cos^2 x + \frac{1}{\cos^2 x} \rightarrow \cos^2 x > 0 \rightarrow R_f = [1, +\infty)$

ب) $y = \sqrt{\frac{x^2+1}{x}} \rightarrow \sqrt{x+1/x} \rightarrow R_f = \sqrt{(-\infty, 2] \cup [2, +\infty)} \rightarrow R_f = (-\infty, \sqrt{2}] \cup [\sqrt{2}, +\infty)$