

الف) $y = x^2 - 5 \Rightarrow x^2 = y + 5 \Rightarrow x = 0 \Rightarrow 0 = y + 5 \Rightarrow R_f = [-5, +\infty)$

ب) $y = x^2 + 1 \quad R_f = (-\infty, +\infty) = \mathbb{R}$

الف) $y = x^2 - 4x + 4 \Rightarrow y = (x - 2)^2 + 2 \Rightarrow x - 2 = 0 \Rightarrow y = 2$
 $R_f = [2, +\infty)$

ب) $y = x^2 - 5x + 1 \Rightarrow y = (x - 2.5)^2 - 5.25 \Rightarrow x - 2.5 = 0 \Rightarrow y = -5.25$
 $R_f = [-5.25, +\infty)$

الف) $y = \frac{x^2 + 3}{x^2 - 2} \quad x^2 \geq 0, x^2 \neq 2 \quad D_x = \mathbb{R} - \{\pm\sqrt{2}\}$
 $\Rightarrow y(x^2 - 2) = x^2 + 3 \Rightarrow yx^2 - 2y = x^2 + 3 \Rightarrow x^2 = yx^2 - 2y - 3$
 ~~$\Rightarrow x^2 - yx^2 = -2y - 3 \Rightarrow x^2(1 - y) = -2y - 3$~~
 $\Rightarrow x^2 = \frac{-2y - 3}{1 - y} \Rightarrow R_f = (-\infty, 1) \cup (\frac{3}{2}, +\infty)$

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

$y = \frac{1}{x^2 - 4x} \Rightarrow yx^2 - 4xy = 1 \Rightarrow yx^2 - 4xy - 1 = 0$
 $x^2 \neq 0, 4$
 $\frac{-4y}{1} \quad \frac{0}{1}$
 $R_f = (-\infty, -\frac{1}{4}] \cup (0, +\infty)$

الف) $y = x^2 - 4x + 2 \quad \text{ext} \left| -\frac{b}{2a} = -\frac{-4}{2} = 2 \right.$
 $9 - 16 + 2 = -5$
 $R_f = [-5, +\infty)$

ب) $y = -x^2 + 4x + 2 \quad \text{ext} \left| -\frac{b}{2a} = -\frac{4}{-2} = 2 \right.$
 $-4 + 16 + 2 = 14$
 $R_f = (-\infty, 14]$

$$\text{الف) } y = \sqrt{x^2 - 4x + 2} \Rightarrow x^2 - 4x + 2 \geq 0 \quad \text{ext} \left| -\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{4 \pm \sqrt{16 - 8}}{2} = \frac{4 \pm \sqrt{8}}{2} = 2 \pm \sqrt{2} \right.$$

$$R_f = [0, 2 + \sqrt{2})$$

$$\text{ب) } y = \sqrt{x^2 + 2x + 1} = -x^2 + 2x + 1$$

$$\text{ext} \left| \frac{2}{1} \right. \quad R_f = [0, \sqrt{14}]$$

$$\text{الف) } y = x^4 + 3x^2 + 2x + 1 \Rightarrow R_f = \mathbb{R}$$

$$\text{ب) } y = \sqrt{x^4 + 2x^2 + 4x + 1} \quad \sqrt{1R} \Rightarrow \text{منفی نمی تواند باشد}$$

$$R_f = [0, +\infty)$$

$$\text{الف) } y = \frac{3x+1}{x-2} \quad R_f = \mathbb{R} - \{3\}$$

$$\text{ب) } y = \sqrt{\frac{4x+1}{x+3}} \Rightarrow \sqrt{1R - \{4\}} \Rightarrow R_f = [0, 2) \cup (2, +\infty)$$

$$\text{الف) } y = \frac{3x+1}{x-2} \quad R_f = \mathbb{R} - \{3\}$$

$$\text{ب) } y = \frac{4x-2}{1-2x} = \frac{4x-2}{-2x+1} \Rightarrow R_f = \mathbb{R} - \{-2\}$$

$$\text{الف) } y = \cos^2 x + \frac{1}{\cos^2 x} \quad R_f = [2, +\infty)$$

$$\text{ب) } y = \sqrt[3]{\frac{x^2+1}{x}} = \sqrt[3]{x + \frac{1}{x}} \quad R_f = (-\infty, -2] \cup [2, +\infty)$$