

الف) $y = x^2 - 5 \rightarrow x^2 = y + 5 \rightarrow x = \pm \sqrt{y+5} \rightarrow \frac{-5}{-4} + \rightarrow R_f = [-5, +\infty)$

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

الف) $y = x^2 - 2x + 4 = x^2 - 2x + 1 + 3 \Rightarrow y = (x-1)^2 + 3 \rightarrow (x-1)^2 = y - 3 \rightarrow x - 1 = \pm \sqrt{y-3} \rightarrow x = \pm \sqrt{y-3} + 1 \rightarrow R_f = [3, +\infty)$

ب) $y = x^2 - 2ax + 1 \Rightarrow a > 0 \rightarrow \begin{cases} \min x = \frac{-b}{2a} = \frac{a}{2} \rightarrow R_f = [\frac{a^2}{4}, +\infty) \\ \min y = \frac{4ac}{b^2} - \frac{4ac}{b^2} + 1 \end{cases}$

الف) $y = \frac{x^2 + 3}{x^2 - 2} \rightarrow x^2 + 3 = yx^2 - 2y \rightarrow yx^2 - x^2 = 3 + 2y \Rightarrow x^2(y-1) = 3 + 2y \rightarrow x = \pm \sqrt{\frac{3+2y}{y-1}}$ $\xrightarrow{\text{شماره}} (1) (-1, 5) \rightarrow \frac{-1.5}{+4-4} \rightarrow R_f = (-\infty, -1.5] \cup (1, +\infty)$

ب) $y = \frac{2|x|+1}{|x|-2} \rightarrow 2|x|+1 = y|x|-2y \rightarrow 2|x|-y|x| = -2y-1 \rightarrow |x|(2-y) = -2y-1 \rightarrow |x| = \frac{-2y-1}{2-y}$ $\xrightarrow{\text{شماره}} (\frac{1}{2}) (2) \rightarrow \frac{-1}{+4-4} \rightarrow R_f = (-\infty, \frac{1}{2}] \cup [2, +\infty)$

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

الف) $y = x^2 - 4x + 3, a > 0 \rightarrow \begin{cases} x_{\min} = \frac{-b}{2a} = \frac{4}{2} = 2 \\ y_{\min} = -1 \end{cases} \rightarrow R_f = [-1, +\infty)$

ب) $y = -x^2 + 2x + 3, a < 0 \rightarrow \begin{cases} x_{\max} = \frac{-b}{2a} = \frac{-2}{-2} = 1 \\ y_{\max} = 4 \end{cases} \rightarrow R_f = (-\infty, 4]$

$$\text{الف) } y = \sqrt{x^2 - 4x + 2} \xrightarrow{a)0} \begin{cases} \min x = \frac{-b}{2a} = \frac{4}{2} = 2 \\ \min y = -1 \rightarrow R_f = \sqrt{[-1, +\infty)} = [0, +\infty) \end{cases}$$

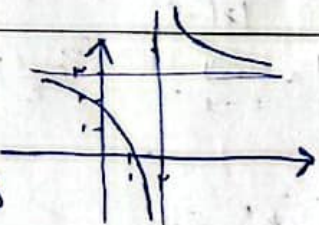
$$\text{ب) } y = \sqrt{-x^2 + 4x + 10} \xrightarrow{a)0} \begin{cases} \max x = \frac{-b}{2a} = \frac{-4}{-2} = 2 \\ \max y = \sqrt{14} \rightarrow R_f = \sqrt{(-\infty, \sqrt{14}]} = [0, \sqrt{14}] \end{cases}$$

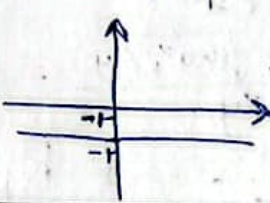
$$\text{الف) } y = x^2 + 3x^2 + 2x + 1 \Rightarrow R_f = \mathbb{R}$$

$$\text{ب) } y = \sqrt{x^2 + 4x + 4} \Rightarrow R_f = [0, +\infty)$$

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

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

$$\text{الف) } y = \frac{3x+1}{x-2} \Rightarrow \begin{cases} \text{مخرج = 0} \rightarrow x = 2 \\ \text{مقام = 0} \rightarrow y = \frac{a}{c} \rightarrow \frac{3}{-2} = -\frac{3}{2} \end{cases} \Rightarrow R_f = \mathbb{R} - \{3\}$$


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


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

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