

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

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

الف) $y = x^2 - 4x + 4 \rightarrow y = (x-2)^2 + 2 \rightarrow \sqrt{y-2} = x-2 \rightarrow x = \sqrt{y-2} + 2 \rightarrow y-2 \geq 0 \rightarrow y \geq 2 \Rightarrow R_f = [2, +\infty)$

ب) $y = x^2 - 5x + 1 \rightarrow y = (x - \frac{5}{2})^2 + \frac{5}{4} - 1 \rightarrow \sqrt{y + \frac{1}{4}} = x - \frac{5}{2} \rightarrow x = \sqrt{y + \frac{1}{4}} + \frac{5}{2} \rightarrow y + \frac{1}{4} \geq 0 \rightarrow y \geq -\frac{1}{4} \Rightarrow R_f = [-\frac{1}{4}, +\infty)$

الف) $y = \frac{x^2 + 3}{x^2 - 2} \rightarrow yx^2 - 2y = x^2 + 3 \rightarrow x^2(y-1) = 3+2y \rightarrow x = \sqrt{\frac{3+2y}{y-1}}$
 $R_f = (-\infty, -\frac{1}{5}] \cup (1, +\infty)$

$\frac{-1/5}{+0-} \quad \frac{1}{-0+}$

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

$\frac{-1/2}{+0-} \quad \frac{2}{-0+}$

$y = \frac{1}{x^2 - 4x} \rightarrow yx^2 - 4xy = 1 \rightarrow yx^2 - 4xy - 1 = 0 \rightarrow \frac{4y \pm \sqrt{16y^2 + 4y}}{2y} \rightarrow y \neq 0, 16y^2 + 4y \geq 0 \rightarrow y(y+1) \geq 0$
 $R_f = (-\infty, -\frac{1}{4}] \cup (0, +\infty)$

$\frac{-1/4}{+0-} \quad \frac{0}{-0+}$

الف) $y = x^2 - 4x + 2 \rightarrow \text{ext} = \begin{vmatrix} -b \\ r_a \\ -\frac{\Delta}{r_a} \end{vmatrix} \sim \begin{vmatrix} 4 \\ -1 \\ -\frac{\Delta}{-1} \end{vmatrix} \xrightarrow{\frac{a > 0}{\min}} R_f = [-2, +\infty)$

ب) $y = -x^2 + 4x + 2 \rightarrow \text{ext} = \begin{vmatrix} -b \\ r_a \\ -\frac{\Delta}{r_a} \end{vmatrix} \sim \begin{vmatrix} 4 \\ 1 \\ -\frac{\Delta}{1} \end{vmatrix} \xrightarrow{\frac{a < 0}{\max}} R_f = (-\infty, 6]$

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

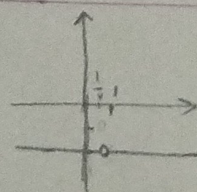
ب) $y = \sqrt{-x^2 + 4x + 2} \rightarrow \text{ext} = \begin{vmatrix} -b \\ r_a \\ -\frac{\Delta}{r_a} \end{vmatrix} \sim \begin{vmatrix} 4 \\ 1 \\ -\frac{\Delta}{1} \end{vmatrix} \xrightarrow{\frac{a < 0}{\max}} R_f = \sqrt{(-\infty, 6]} = [0, \sqrt{14}]$

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

ب) $y = \sqrt{x^2 + 2x^2 + 4x + 1} \rightarrow R_f = \sqrt{\mathbb{R}} = [0, +\infty)$

الف) $y = \frac{x^2 + 1}{x - 2} \rightarrow R_f = \mathbb{R} - \{2\}$ ب) $y = \sqrt{\frac{x^2 + 1}{x + 3}} \rightarrow R_f = \sqrt{\mathbb{R} - \{-3\}} = [0, +\infty) - \{1\}$

الف) $y = \frac{x^2 + 1}{x - 2}$ $x = 2, y = 2$ ب) $y = \frac{x^2 - 2}{1 - 2x} = (-2)$
 $x = \frac{1}{2}, y = 0$ $D_f = \mathbb{R} - \{\frac{1}{2}\}$



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الف) $y = \cos^5 x + \frac{1}{\cos^2 x} \rightarrow R_7 [2, +\infty)$

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