

$$y = x^2 - 5 \Rightarrow y + 5 = x^2 \quad (\text{الف})$$

$$\Rightarrow x = \sqrt{y+5} \Rightarrow R = [-5, \infty)$$

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

$$\Rightarrow R = \mathbb{R}$$

$$y = x^2 - 4x + 4 \Rightarrow y = x^2 - 4x + 4 + 1 \Rightarrow y = (x-2)^2 + 1 \quad (\text{الف})$$

$$\Rightarrow y - 1 = (x-2)^2 \Rightarrow \pm \sqrt{y-1} + 2 = x \Rightarrow R = [1, +\infty)$$

$$y = 2x^2 - 5x + 1 \Rightarrow x^2 - \frac{5}{2}x + \frac{1}{2} + \frac{5}{4} - \frac{5}{4} = x^2 - \frac{5}{2}x + \frac{9}{4} = \left(x - \frac{5}{4}\right)^2 - \frac{25}{16} + \frac{9}{4} = \left(x - \frac{5}{4}\right)^2 - \frac{7}{16}$$

$$\Rightarrow \left(x - \frac{5}{4}\right)^2 - \frac{7}{16} = y \Rightarrow \pm \sqrt{y + \frac{7}{16}} + \frac{5}{4} = x \Rightarrow R = \left[-\frac{7}{16}, +\infty\right)$$

$$y = \frac{x^2 + 3}{x^2 - 2} = yx^2 - 2y = x^2 + 3 \Rightarrow yx^2 - x^2 = 2y + 3 \Rightarrow x^2(y-1) = 2y+3 \quad (\text{الف})$$

$$\Rightarrow x^2 = \frac{2y+3}{y-1} \Rightarrow x = \pm \sqrt{\frac{2y+3}{y-1}} \Rightarrow R = (1, +\infty)$$

$$\frac{2|x|+1}{|x|-2} = y \Rightarrow y|x| - 2y = 2|x| + 1 \Rightarrow y|x| - 2|x| = 2y + 1 \Rightarrow |x|(y-2) = 2y+1$$

$$\Rightarrow |x| = \frac{2y+1}{y-2} \Rightarrow R = (2, +\infty)$$

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

$$x^2 - 4x = 0 \Rightarrow x(x-4) = 0$$

$$\Rightarrow x \neq 0, x \neq 4$$

$$\Rightarrow (x-2)^2 = t \Rightarrow y = \frac{1}{t-4} \Rightarrow \begin{cases} 0 \leq t < 4 \Rightarrow t-4 < 0 \Rightarrow y = \frac{1}{\text{موجب}} < 0 \Rightarrow y = -\frac{1}{4} \Rightarrow y \rightarrow -\infty \\ 4 < t \Rightarrow t-4 > 0 \Rightarrow y = \frac{1}{\text{موجب}} > 0 \Rightarrow y = \frac{1}{t-4} \Rightarrow y \rightarrow +\infty \end{cases}$$

$$\Rightarrow R = \left(-\infty, -\frac{1}{4}\right] \cup (0, +\infty)$$

$$y = x^2 - 4x + 4 \Rightarrow \min \left| \begin{array}{l} x_{\min} = \frac{-b}{2a} = 2 \\ y_{\min} = -4 \end{array} \right\} [-4, +\infty)$$

$$y = -x^2 + 4x + 4 \Rightarrow \max \left| \begin{array}{l} x_{\max} = 2 \\ y_{\max} = 8 \end{array} \right\} \rightarrow R = (-\infty, 8]$$

$$y = \sqrt{x^2 - 5x + 1} \Rightarrow \min_{x \in \mathbb{R}} \Rightarrow R = \sqrt{[-1, 0] + \infty} \Rightarrow R = [0, +\infty) \quad (\text{الف})$$

$$y = \sqrt{-x^2 + 4x + 10} \Rightarrow \max_{x \in \mathbb{R}} \Rightarrow R = \sqrt{(-\infty, 14]} \Rightarrow R = [0, 14] \quad (\text{ب})$$

1, 1, 5

4

$$R_f = 1R \quad \checkmark$$

(الف)

2

$$R_f = R^+ + \{0\} \Rightarrow [0, +\infty) \quad \checkmark$$

ب

5

$$\frac{x+1}{x-2} \Rightarrow R = \left\{ \frac{3}{1} \right\} \quad \checkmark$$

(الف)

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

2

8

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



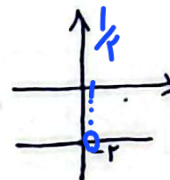
(الف)

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1, 1, 5

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

$$a \neq \frac{1}{4}$$



(ب)

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

1, 1, 5

$$\sqrt{\frac{x^4+1}{x}} \Rightarrow R_f = \sqrt{(-\infty, -2]} \cup [2, +\infty) \quad (\text{ب})$$

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

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