

$$f(x) = \sqrt{x+4} \sqrt{x-4} \xrightarrow{-x+4, 1, 1, 1, 1, 1} f(x) = \sqrt{x-4+4} \sqrt{x-4} + 1 = \sqrt{(x-4+4)^2} = \sqrt{x-4+4}$$

$$g(x) = \sqrt{x-4} \sqrt{x-4} \xrightarrow{\pm 4} f(x) = \sqrt{x-4-4} \sqrt{x-4+4} = \sqrt{(x-4-4)^2} = \sqrt{x-4-4}$$

$$g(x) = \sqrt{x-4-4} / g(x) + f(x) = \sqrt{x-4-4} + \sqrt{x-4-4} = 2\sqrt{x-4-4} = 2\sqrt{x-8}$$

$$a=0 / b=2 / c=-4 \quad \frac{a+b}{c} = -\frac{1}{2}$$

$$f(x) = \frac{x+2}{(x-1)(x-4)} \quad g(x) = \{(x, 1), (1, 0), (3, 0), (0, 5)\} \quad Df \cap R = \{1, 3, -2\}$$

$$Df \cap Dg \rightarrow \{0, 2\} \quad Dg = \{1, 1, 3, 0\} \Rightarrow$$

$$\frac{g}{f} = (0, \frac{2}{-1}) \rightarrow (2, \frac{1}{-4}) \rightarrow (0, 4), (2, -\frac{1}{4})$$

$$f(x) \rightarrow x = 1, 3, 5, -1 \rightarrow x = \pm \frac{1}{4}, 2, \frac{5}{4} \quad f(x) = (\frac{1}{4}, 1), (\frac{5}{4}, -1), (2, 2)$$

$$g(x) \rightarrow x^2 = 1, 3, 5 \rightarrow x = \pm 1, \pm \sqrt{3}, \pm \sqrt{5}$$

$$f \cap g = \{(1, 2), (1, 2), (\sqrt{3}, -1), (\sqrt{3}, -1), (-2, 2), (2, 2)\}$$

$$g \cdot f(x) + 1 \rightarrow \{(-2, 1), (1, 3), (2, 0), (-1, 1)\} \quad \frac{f}{g} = \{(1, -4), (3, -1)\}$$

$$\frac{f}{g} \rightarrow Df \cap Dg = \{\pm 1, 3\} - \{-1\} \rightarrow \frac{f(x)}{g(x)} = -4 / \frac{f(x)}{g(x)} = -1$$

$$f(x) = \{(x, 1), (3, 1), (4, 0), (-5, 0)\} \quad g = \{(5, 1), (x, 3), (-2, 4), (-1, 2), (3, 2)\}$$

$$Df \cap Dg = \{2, 3, -2\} \quad h = f \cdot g \rightarrow h = \{(2, 0), (-2, 4), (2, 0)\}$$

$$f(x) = \frac{\sqrt{2x-1}}{x-2} \quad g(x) = [x] + [-x] \quad \left(\frac{f}{g}\right)x = \frac{\sqrt{2x-1}}{x-2} \cdot \frac{[x] + [-x] + 1}{[x] + [-x] + 1}$$

$$\begin{cases} ① 2x-1 \geq 0 \rightarrow x \geq \frac{1}{2} \\ ② \sqrt{2x-1} \geq 0 \rightarrow x^2 - 1 \leq 0 \rightarrow [0, 1] \\ ③ x-2 \neq 0 \rightarrow x \neq 2 \\ ④ [x] + [-x] + 1 \neq 0 \rightarrow [x] + [-x] \neq -1 \rightarrow x \in \mathbb{Z} \end{cases}$$

$$\frac{f}{g} = \{0, 2, 3\}$$

$$[x] + [-x] = -1 \rightarrow x \notin \mathbb{Z}$$

$$[x] + [-x] = 0 \rightarrow x \in \mathbb{Z}$$

$$f(x) = \sqrt{x^2 + 0.5x - 0.25} \quad g(x) = \{(1, x)(x, 2)(x, 4)(0, 1)\} \quad Df = [1, 2] \Rightarrow \text{range } g = \{(1, 2), (2, 4)\}$$

$$-1 \leq x \leq 1 \quad x^2 + 0.5x - 0.25 \rightarrow (x+1)(x-0.5) \Rightarrow x = 1, 0.5 \quad Dg = [1, 2, 4, 0]$$

$$h(x) = \frac{f(x)}{g(x)} \rightarrow h(x) = \frac{f(1)}{g(1)}, \frac{f(2)}{g(2)}, \frac{f(4)}{g(4)} \rightarrow h(x) = \{(1, 0.5)(2, \frac{\sqrt{2}}{2})(4, 0)\}$$

$$\text{الف) } y = x^3 - 3x^2 + 3x \xrightarrow{\pm 1} y = x^3 - 3x^2 + 3x - 1 + 1 \rightarrow (x-1)^3 + 1$$

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

$$\text{ب) } y = \frac{1}{x^2 - 4} \rightarrow x^2 - 4y = 0 \rightarrow x = \frac{4y \pm \sqrt{16y^2 + 4y}}{2y} \rightarrow x = \frac{2y \pm \sqrt{4y^2 + y}}{y}$$

$$R_f = \mathbb{R} - (-1, 0]$$

$$\text{الف) } y = x^2 - 4x + 1 \rightarrow y_{\min} = \frac{4ac - b^2}{4a} = \frac{4(1) - 16}{4} = 1 - 4 = -3 \quad R_f = [-3, +\infty)$$

$$\text{ب) } y = x^2 + 4x + 3 \rightarrow y_{\min} = \frac{-12 - 16}{-2} = 2 + 4 = 6 \rightarrow R_f = [6, +\infty)$$

$$\text{ج) } y = \sqrt{x^2 - 4x + 4} \rightarrow y_{\min} = \frac{-12 - 16}{2} = -14 \rightarrow R_f = \sqrt{[-14, +\infty)} \Rightarrow [0, +\infty)$$

$$\text{د) } y = \sqrt{4x - x^2} = y_{\max} \rightarrow \frac{-4}{-2} = 2 \rightarrow R_f = \sqrt{[0, 4]} \rightarrow R_f = [0, 2]$$

$$\text{الف) } y = x^3 - 0.5x^2 + 2x + 1 \rightarrow R_f = \mathbb{R}$$

$$\text{ب) } y = x^3 - 4x^2 + 3x + 2 \rightarrow R_f = \mathbb{R}$$

$$\text{ج) } y = \sqrt{x^3 - 4x^2 + 0.5x + 1} \rightarrow R_f = [0, +\infty)$$

$$\text{د) } y = (x^2 - 0.5x^2 + 3x + 1) \rightarrow R_f = [0, +\infty)$$

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

$$\text{ب) } y = \frac{x^2 + 1}{x + 1} \rightarrow R = \mathbb{R} - \{-1\}$$