

$$f(x) + g(x) = \frac{\sqrt{x + \varepsilon} \sqrt{x - \varepsilon}}{(\sqrt{x - \varepsilon} + 2)^2} + \frac{\sqrt{x - \varepsilon} \sqrt{x + \varepsilon}}{(\sqrt{x + \varepsilon} - 2)^2}$$

$$= \sqrt{x - \varepsilon} + 2 + \sqrt{x - \varepsilon} - 2 = 2\sqrt{x - \varepsilon} \quad 2\sqrt{x - \varepsilon} = a + b\sqrt{x + c}$$

$$\Rightarrow \begin{cases} a=0 \\ b=2 \\ c=-\varepsilon \end{cases} \Rightarrow \frac{a+b}{c} = \left(-\frac{1}{\varepsilon}\right)$$

$$\frac{g}{f} = \left\{ \left(2, -\frac{1}{\varepsilon}\right), \left(1, \frac{0}{0}\right), \left(2, \frac{0}{0}\right), \left(0, \frac{\varepsilon}{\varepsilon} = 1\right) \right\}$$

الف) $f(x) \Rightarrow \left\{ \left(\frac{1}{4}, 2\right), \left(\frac{9}{4}, -1\right), \left(\frac{9}{4}, 2\right), \left(\frac{1}{4}, 9\right) \right\}$

ب) $f(x) \Rightarrow \left\{ (\pm 1, 2), (\pm \sqrt{c}, -1), (\pm 2, 2) \right\}$

ج) $2g(x) + 1 \Rightarrow \left\{ (-2, 9), (1, 2), (2, 9), (-1, 1) \right\}$

د) $\frac{f}{g} \Rightarrow \left\{ (1, -\varepsilon), (2, -1) \right\}$

$$h = 2f + g \Rightarrow \left\{ (2, 5), (-2, 4), (2, 8) \right\}$$

$$f(x) = \sqrt{\sqrt{x-2}} \quad , \quad g(x) = \underbrace{[x] + [-x]}_{x \in \mathbb{R}}$$

$x-2 \sim x \neq +2$ $\sqrt{x-2} > 0 \rightarrow c(x) > x^2 \rightarrow 0 \leq x \leq c$

$\left(\frac{f}{g+1}\right)(x) \rightarrow g(x) \neq -1 \rightarrow x \in \mathbb{Z}$

$\left. \begin{array}{l} (1) \ 0 < x < c \\ (2) \ x \in \mathbb{Z} \\ (3) \ x \neq 2 \end{array} \right\} \Rightarrow D\left(\frac{f}{g+1}\right) = \left\{ 0, 1, 3 \right\}$

$$f(x) = \sqrt{-x^2 + 2x - 2} \quad , \quad g(x) = \{(1, 2) (2, 2) (3, 2) (4, 1)\}$$

$$-(x-1)(x-2) \Rightarrow \frac{1}{-(x-1)(x-2)} \Rightarrow \frac{1}{-(x-1)(x-2)} \quad x \text{ منفرج} \rightarrow \{1, 2, 3\}$$

$$h(x) = \frac{f(x)}{g(x)} = \left\{ (1, \frac{0}{2}) (2, \frac{1}{2}) (3, \frac{1}{2}) (4, \frac{1}{1}) \right\} \rightarrow \left\{ (1, 0) (2, \frac{1}{2}) (3, \frac{1}{2}) (4, 1) \right\}$$

$$\text{ا) } y = \underbrace{x^2 - 2x + 1}_{(x-1)^2} + 1 \rightarrow (x-1)^2 = y-1 \rightarrow x-1 = \sqrt{y-1}$$

$$\rightarrow x = \sqrt{y-1} + 1 \Rightarrow y \in \mathbb{R}$$

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

$$\rightarrow 4y^2 + 4y \geq 0 \rightarrow y^2 + y \geq 0 \rightarrow y(y+1) \geq 0 \rightarrow y \in (-\infty, -1] \cup (0, \infty)$$

$$\text{ا) } y = x^2 - 2x + 1 \rightarrow x_5 = 2 \rightarrow y_5 = 2 - 2 + 1 = 1 \rightarrow D_y = [1, \infty)$$

$$\text{ب) } y = -x^2 + 4x + 2 \rightarrow x_5 = 2 \rightarrow y_5 = -4 + 8 + 2 = 6 \rightarrow D_y = (-\infty, 6]$$

$$\text{ج) } y = \sqrt{x^2 - 2x - 2} \rightarrow x_5 = 2 \rightarrow y_5 = 2 - 2 - 2 = -2 \rightarrow D_y = [-2, \infty) \Rightarrow D_y = [0, \infty)$$

$$\text{د) } y = \sqrt{4x - x^2} \rightarrow x_5 = 2 \rightarrow y_5 = 4 - 4 = 0 \rightarrow D_y = [0, 4] \rightarrow D_y = [0, 2]$$

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

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

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

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

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

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