

۱- $f(x) = \sqrt{x + \epsilon \sqrt{x - \epsilon}}$, $g(x) = \sqrt{x - \epsilon \sqrt{x - \epsilon}}$, $x \geq 1 \rightarrow x \geq 1 \checkmark$
 $\sqrt{x - \epsilon} \geq 1 \rightarrow \sqrt{x - \epsilon} - 1 \geq 0$
 $(f(x) + g(x))^2 = a + b\sqrt{x + c}$, $\frac{a+b}{c} = ?$
 $f(x) = \sqrt{(x - \epsilon + 1)^2} = |\sqrt{x - \epsilon} + 1| = \sqrt{x - \epsilon} + 1$
 $g(x) = \sqrt{(x - \epsilon - 1)^2} = |\sqrt{x - \epsilon} - 1| = \sqrt{x - \epsilon} - 1$
 $f(x) + g(x) = 2\sqrt{x - \epsilon}$
 $\Rightarrow a = 0, b = 2, c = -\epsilon$
 $\frac{a+b}{c} = \frac{0+2}{-\epsilon} = -\frac{2}{\epsilon} = \boxed{-\frac{1}{\epsilon}}$

۲- $f(x) = \frac{x+1}{x^2 - 4x + 3}$, $g(x) = \left\{ (1, 1), (0, 0), (2, 2), (3, 3) \right\}$, $\frac{g}{f} = ?$
 $f(1) = -\frac{1}{2}$, $f(0) = \frac{1}{3}$
 $\frac{g}{f} = \left\{ (1, -\frac{1}{2}), (0, \frac{1}{3}) \right\}$
 $= \left\{ (2, -\frac{1}{2}), (0, 1) \right\}$

۳- الف) $f(x) = \left\{ (\frac{1}{2}, 2), (\frac{3}{4}, -1), (2, 2), (-\frac{1}{2}, 4) \right\}$
 ب) $f(x^2) = \left\{ (1, 2), (-1, 2), (\sqrt{3}, -1), (-\sqrt{3}, -1), (2, 2), (-2, 2) \right\}$

ج) $2g(x) + 1 = \left\{ (-2, 1), (1, 3), (3, 9), (-1, 1) \right\}$

د) $\frac{f}{g} = \left\{ (1, -\frac{1}{2}), (-1, \frac{1}{2}), (3, -1) \right\} = \left\{ (1, -\frac{1}{2}), (3, -1) \right\}$

ه) $h = 2f + g = \left\{ (2, 2+3), (-2, 0+4), (2, 2+3) \right\} = \left\{ (2, 5), (-2, 4), (2, 5) \right\}$

و) $\left(\frac{f}{g+1}\right)(x)$, $D_f = ?$, $D_{\frac{f}{g+1}} = D_f \cap D_{g+1} = \{x \mid g+1 \neq 0\}$

① $\sqrt{3x} \rightarrow x \geq 0$
 ② $\sqrt{3x - 1} \rightarrow 3x - 1 \geq 0 \Rightarrow \sqrt{3x} \geq \frac{1}{\sqrt{3}} \Rightarrow x \geq \frac{1}{3}$
 ③ $x - 2 \neq 0 \Rightarrow x \neq 2$

$$D_f = \{1, 2, 3\} = [0, 3] - \{2\}$$

$$b_{g+1} = 1R$$

$$[x] + [-x]$$

$$\text{if } x \in \mathbb{Z} \Rightarrow 0$$

$$\text{if } x \notin \mathbb{Z} \Rightarrow -1$$

$$\Rightarrow +1 \Rightarrow 0+1=1$$

$$-1+1=0$$

$$\Rightarrow \left\{ \frac{0}{2+1} = \{0, 1, 3\} \right\}$$

$$f(x) = \sqrt{5x - x^2 - 4} \rightarrow \sqrt{-(x-5)(x+4)} \rightarrow \sqrt{-(x-1)(x-4)}$$

$$\frac{1}{-1+4} = \frac{1}{3} \Rightarrow [1, 4]$$

$$f(1) = \sqrt{5-1-4} = 0, f(2) = \sqrt{10-4-4} = \sqrt{2}, f(4) = \sqrt{20-16-4} = 0$$

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

$$\text{الف) } y = x^3 - 3x^2 + 3x + 1 - 1 \Rightarrow y = (x-1)^3 + 1 \Rightarrow (x-1)^3 = y-1 \Rightarrow \sqrt[3]{y-1} = x-1 \Rightarrow x = \sqrt[3]{y-1} + 1$$

$$R_f = 1R$$

$$\text{ب) } y = \frac{1}{x^2 - 2x} \Rightarrow yx^2 - 2yx = 1 \Rightarrow yx^2 - 2yx - 1 = 0$$

$$y \neq 0 \Rightarrow \Delta = b^2 - 4ac = 4y^2 + 4y \Rightarrow x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y}$$

$$\text{الف) } -\frac{b}{2a} = \frac{2}{-1} = -2 \Rightarrow x = 1 \Rightarrow y = -1 \Rightarrow R_f = [1, +\infty)$$

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$$R_f = (-\infty, 12]$$

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$$R_f = [0, 3]$$

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$$\text{د) } [0, +\infty)$$

الف - ١٥) $g = \frac{r_{n+1}}{n+1}$ $R_f = R - \{a\} \Rightarrow R_f = |R - \{r\}|$
 $ad \neq bc \checkmark$

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