

$$f(n) + g(n) = a + b\sqrt{n+c} = \sqrt{n-4}\sqrt{n-4} - \sqrt{n-4} + \sqrt{n-4+2} = \sqrt{n-4} = 2\sqrt{n-4} \Rightarrow a=0 \quad b=2 \quad c=-4 \quad \frac{a+b}{c} = \frac{2}{-4} = \left(\frac{-1}{2}\right)$$

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

ا) $f(2n) = \left\{ \left(\frac{1}{2}, 2\right), \left(\frac{3}{2}, -1\right), \left(2, 2\right), \left(-\frac{1}{2}, 2\right) \right\}$
 ب) $f(n^2) = \left\{ (1, 2), (-1, 2), \left(\sqrt{2}, -1\right), \left(-\sqrt{2}, -1\right), (2, 2), (-2, 2) \right\}$
 ج) $2g(n)+1 = \left\{ (-2, 9), (1, 3), (3, 9), (-1, 1) \right\}$
 د) $\frac{2f}{g} = \left\{ (1, 4), \left(2, -\frac{1}{2}\right) \right\}$

$$h = 2fg = \left\{ (2, 8), (2, 8), (-2, 6) \right\}$$

$f(n) = \frac{\sqrt{4n-n}}{n-4} \rightarrow \begin{cases} 4n > 0 \rightarrow n > 0 \\ 4n-n > 0 \rightarrow 3n > 0 \rightarrow n > 0 \end{cases} \rightarrow D_f = [0, 3] - \{4\}$
 $g(n) = [n] + [-n] \rightarrow \begin{cases} x \in \mathbb{Z} \rightarrow g(n)+1 = 1 \\ x \notin \mathbb{Z} \rightarrow g(n)+1 = 0 \end{cases} \rightarrow n \in \{0, 1, 2\}$
 $h = \left(\frac{f}{g+1}\right)(n) \Rightarrow D_h = \{0, 1, 2\}$

$$f(x) = \sqrt{a^2 - x^2 - c} \Rightarrow -a^2 \leq a^2 - x^2 - c \leq 0 \quad \frac{1}{-d + b} \rightarrow D_f = [1, 4]$$

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

د

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

$$R_f = \mathbb{R}$$

$$\text{ب) } y = \frac{1}{x^2 - 2x} \Rightarrow y(x^2 - 2x) - 1 = 0 \\ x = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y} \rightarrow \begin{cases} 4y^2 + 4y > 0 \\ \frac{-1 \pm \sqrt{1-4y}}{2y} \end{cases} \\ R_f = (-\infty, -1] \cup (0, +\infty)$$

$$\text{الف) } y = x^2 - 4x + 1 \quad x_{\min} = 2 \quad y_{\min} = -3 \quad R_f = [-3, +\infty)$$

$$\text{ب) } y = -x^2 + 4x + 2 \quad x_{\max} = 2 \quad y_{\max} = 6 \quad R_f = (-\infty, 6]$$

$$\text{ج) } y = \sqrt{x^2 + 4x - 3} \quad x_{\min} = -2 \quad y_{\min} = (-2-2) = -4 \quad R_f = [-4, +\infty)$$

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

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

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

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

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

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

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