

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

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

$$D_f = [1, 4]$$

$$\begin{aligned} 2x - x^2 - 4 &\geq 0 \\ -x^2 + 2x - 4 &\geq 0 \\ x &\in [1, 4] \end{aligned}$$

$$-\frac{1}{q} + \frac{1}{p} =$$

$$f(1) = \sqrt{0} = 0$$

$$f(2) = \sqrt{2}$$

$$f(3) = 0$$

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

$$\sqrt[3]{y - 1} = x - 1 \Rightarrow \sqrt[3]{y - 1} + 1 = x \quad R_f = \mathbb{R}$$

$$\text{ب) } y = \frac{1}{x^2 - 2x}$$

$$yx^2 - 2yx - 1 = 0$$

$$y \neq 0 \quad x = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y} \rightarrow 4y^2 + 4y \geq 0 \Rightarrow y + 1 \geq 0$$

$$y \geq -1 \Rightarrow x = 0 \quad X$$

$$R_f = (-\infty, -1] \cup (0, \infty)$$

$$\frac{y(1+y) - 1}{1+y} = \frac{y}{1+y}$$

$$\text{الف) } y = x^2 - 5x + 10$$

$$\min \left| \frac{-b}{2a} = \frac{5}{2} = 2.5 \right|$$

$$R_f = [4, \infty)$$

$$\text{ب) } y = -x^2 + 4x + 3$$

$$\max \left| \frac{-b}{2a} = \frac{-4}{-2} = 2 \right|$$

$$R_f = (-\infty, 11]$$

$$\text{ج) } y = \sqrt{x^2 - 5x - 3}$$

$$\min \left| \frac{-b}{2a} = \frac{5}{2} = 2.5 \right|$$

$$R_f = \sqrt{[-1, \infty)} = [0, \infty)$$

$$\text{د) } y = \sqrt{4x - x^2}$$

$$\max \left| \frac{-b}{2a} = \frac{-4}{-2} = 2 \right|$$

$$R_f = \sqrt{(-\infty, 4]} = [0, 2]$$

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

$$R_f = \mathbb{R}$$

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

$$R_f = \mathbb{R}$$

$$\text{ج) } y = \sqrt{x^3 - 4x^2 + 2x + 1}$$

$$R_f = \sqrt{\mathbb{R}} = [0, \infty)$$

$$\text{د) } y = (x^3 - 2x^2 + 3x + 1)^2$$

$$R_f = (\mathbb{R})^2 = [0, \infty)$$

$$\text{الف) } y = \frac{3x+1}{x-2}$$

$$R_f = \mathbb{R} - \{3\}$$

$$\text{ب) } y = \frac{2x+1}{x+1}$$

$$R_f = \mathbb{R} - \{2\}$$