

٤) $f(x) = \sqrt{8x - x^2 - 2}$ / $g(x) = \left\{ (1,2), (2,2), (2,4), (0,1) \right\}$ / $h(x) = \frac{f(x)}{g(x)} = ?$
 $\hookrightarrow x^2 - 8x + 2 \leq 0$
 $(x-1)(x-7) \leq 0$ / $\frac{1}{x-1} + \frac{2}{x-7} = 0$
 $\hookrightarrow (1,7)$ / $\left\{ \begin{array}{l} x=1 \rightarrow \frac{f(1)}{g(1)} = 0 \\ x=2 \rightarrow \frac{f(2)}{g(2)} = 1 \\ x=7 \rightarrow 0 \end{array} \right. \Rightarrow \left\{ (1,2), (2,2), (2,4) \right\}$

٥) الف) $y = x^3 - 2x^2 + 2x - 1$ / $y = (x-1)^3 + 1 \rightarrow y-1 = (x-1)^3 \rightarrow \sqrt[3]{y-1} = x-1$
 $\sqrt[3]{y-1} + 1 = x$ / $R_f = \mathbb{R}$

ب) $y = \frac{1}{x^2 - 2x + 1}$ / $y^2 - 2y + 1 = 0$
 $\Delta = 4 - 4 = 0$ / $(-2y) \pm \sqrt{4y^2 - 4y} = 0$ / $\frac{-1 \pm 0}{2 \pm 1} = 0$ / $R_f = (-\infty, -1] \cup (0, +\infty)$
 $x = \frac{2y \pm \sqrt{4y^2 - 4y}}{2y} \neq 0 \rightarrow y \neq 0$

١) الف) $y = x^2 - 2x + 1$ / $\left\{ \begin{array}{l} x = \frac{-b}{2a} = 1 \\ y = 0 \end{array} \right.$ / $2-1+1 = 2$ / $R_f = [4, +\infty)$
 ب) $a > 0$ / (1) / $b, \min$

ب) $y = -x^2 + 4x + 3$ / $\left\{ \begin{array}{l} x = \frac{-b}{2a} = 2 \\ y = 7 \end{array} \right.$ / $R_f = (-\infty, 7]$
 $a < 0$ / $b, \max$

٢) $y = \sqrt{x^2 - 2x - 3}$ / $\left\{ \begin{array}{l} x = \frac{-b}{2a} = 1 \\ y = 0 \end{array} \right.$ / $\sqrt{-1, +\infty} = [0, +\infty)$ / R_f
 $a > 0$ / $b, \min$

٣) $y = \sqrt{4x - x^2}$ / $\left\{ \begin{array}{l} x = \frac{-b}{2a} = 2 \\ y = 2 \end{array} \right.$ / $\sqrt{(-\infty, 4]} = [0, 2]$ / R_f
 $a < 0$ / $b, \max$

٤) الف) $y = \frac{1}{x^2 - 2x + 1}$ / $\mathbb{R}$ / $[0, +\infty)$ / $y = \frac{1}{x^2 - 2x + 1} \rightarrow y > 0 \rightarrow [0, +\infty)$

١٠) الف) $y = \frac{x^2 + 2x + 1}{x^2 + 1}$ / $\frac{1}{x^2 + 1} \rightarrow \frac{1}{x^2 + 1} \neq 0 \rightarrow R_f = \mathbb{R} - \{0\}$

ب) $y = \frac{x^2 + 1}{x + 1}$ / $x \neq -1 \Rightarrow R_f = \mathbb{R} - \{-1\}$