

$$f(x) = \sqrt{x-2} + 2\sqrt{x-2} + 2 = \sqrt{(\sqrt{x-2} + 2)^2} = |\sqrt{x-2} + 2| = \sqrt{x-2} + 2$$

$$g(x) = \sqrt{x-2} - 2\sqrt{x-2} + 2 = \sqrt{(\sqrt{x-2} - 2)^2} = |\sqrt{x-2} - 2| \xrightarrow{x \geq 1} g(x) = \sqrt{x-2} - 2$$

$$\Rightarrow f(x) + g(x) = \sqrt{x-2} + 2 + \sqrt{x-2} - 2 = 0 + 2\sqrt{x-2} = \begin{cases} a=0 \\ b=2 \\ c=-2 \end{cases}$$

$$\Rightarrow \frac{a+b}{c} = \frac{0+2}{-2} = -1 \leftarrow \text{جواب}$$

$$D_f = \mathbb{R} - \{1, 2\} \quad \Leftrightarrow x \neq \left\{ \frac{1}{2} \right\} \Leftrightarrow x^2 - 2x + 1 \neq 0$$

$$D_g = \{2, 1, 2, 0\} \quad D_{\frac{g}{f}} = D_f \cap D_g - \left\{ \frac{2}{f(x) \neq 0} \right\} \Rightarrow D_{\frac{g}{f}} = \{2, 0\}$$

$$\Rightarrow \left(\frac{g}{f} \right)(x) = \left\{ \left(2, \frac{1}{-2} \right), \left(0, \frac{2}{\frac{1}{2}} \right) \right\} \leftarrow \text{جواب}$$

$$(0, 4)$$

الف) $2x = D_f \Rightarrow$ هر عضو از D_f $\Rightarrow f(2x) = \left\{ \left(\frac{1}{2}, 2 \right), \left(\frac{3}{2}, -1 \right), (2, 2), \left(-\frac{1}{2}, 4 \right) \right\}$

ب) $x^2 = D_f \Rightarrow$ هر عضو از D_f $\Rightarrow f(x^2) = \left\{ (1, 2), (-1, 2), (\sqrt{2}, -1), (-\sqrt{2}, -1), (2, 2), (-2, 2) \right\}$

ج) $2g(x) + 1 = \left\{ (-2, 19), (1, 3), (3, 9), (-1, 1) \right\}$

د) $g(x) \neq 0 \Rightarrow \left(\frac{2f}{g} \right)(x) = \left\{ (1, -2), (3, -1), \left(-\frac{1}{2}, \frac{4}{3} \right) \right\}$

$$h(x) = \left\{ (2, 2+3), (-2, 2+4), (3, 2+3) \right\}$$

$$\Rightarrow h(x) = \left\{ (2, 5), (-2, 6), (3, 5) \right\}$$

$$f(x) = \frac{\sqrt{2x} - x}{x-2} \quad \left\{ \begin{array}{l} x \neq 2 \\ x \geq 0 \end{array} \right\} \quad \sqrt{2x} - x \geq 0 \Rightarrow \sqrt{2x} \geq x \Rightarrow 2x \geq x^2 \Rightarrow x^2 - 2x \leq 0$$

$$\Rightarrow D_f = [0, 2) \cup (2, 3] \quad (B)$$

$$D_g = \mathbb{R} \quad g+1 \neq 0 \Rightarrow [x] + [-x] + 1 \neq 0 \Rightarrow [x] + [-x] \neq -1 \Rightarrow x \in \mathbb{Z} \quad (A)$$

$$D_{\frac{f}{g+1}} = B \cap A = \{0, 1, 3\} \leftarrow \text{جواب}$$

$$-x^2 + 2x - 1 \geq 0 \Rightarrow x \leq 1 \Rightarrow D_f = [1, 1]$$

$$g(x) = 0 \Rightarrow h(x) = \left\{ \left(1, \frac{0}{1}\right) \left(1, \frac{\sqrt{1}}{1}\right) \left(1, \frac{0}{1}\right) \right\}$$

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

$$\text{ب) } yx^2 - 2yx = 1 \Rightarrow yx^2 - 2yx - 1 = 0 \quad x = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y} \\ (y \neq 0) \quad 4y^2 + 4y \geq 0 \Rightarrow y^2 + y \geq 0 \Rightarrow y \in (-1, 0] \Rightarrow R_f = \mathbb{R} - (-1, 0]$$

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

$$\text{ب) } \frac{-b}{2a} = \frac{-2}{-1} = 2 \Rightarrow y_{\min} = -9 + 12 + 1 = 4 \Rightarrow R_f = [4, +\infty)$$

$$\text{ج) } \frac{-b}{2a} = 2 \Rightarrow y_{\min} = 1 - 4 + 4 = 1 \Rightarrow R_f = [1, +\infty)$$

$$\text{د) } \frac{-b}{2a} = 3 \Rightarrow y_{\min} = -9 + 18 = 9 \Rightarrow R_f = [9, +\infty)$$

$$\text{الف) } \text{بزرگترین توان فرد است} \Rightarrow R_f = \mathbb{R} \quad \text{ب) } \text{بزرگترین توان زوج است} \Rightarrow R_f = \mathbb{R}$$

$$\text{ج) } R_f = \sqrt{\mathbb{R}} \Rightarrow R_f = [0, +\infty)$$

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

$$\text{الف) } R_f = \mathbb{R} - \left\{ \frac{a}{c} \right\} \Rightarrow R_f = \mathbb{R} - \{1\}$$

$$\text{ب) } R_f = \mathbb{R} - \left\{ \frac{a}{c} \right\} \Rightarrow R_f = \mathbb{R} - \{2\}$$