

$$f(x) = \sqrt{x + \sqrt{x - x + x}} = \sqrt{1 + \sqrt{x - x + x}} = \sqrt{1 + \sqrt{x - x + x}}$$

$$g(x) = \sqrt{x - \sqrt{x - x + x}} = \sqrt{1 - \sqrt{x - x + x}} = \sqrt{1 - \sqrt{x - x + x}}$$

$$f(x) + g(x) = \sqrt{x - x} = 0 \quad \text{و} \quad \sqrt{x - x} = 0 \quad \text{و} \quad \sqrt{x - x} = 0$$

$$D_{f \cap D_g} = \{0, 1, 2, 3\} \cap \{1, 2\} = \{1, 2\}$$

$$Df = \{x \in \mathbb{R} \mid x \neq 0\} \rightarrow \mathbb{R} - \{0\} = \{x \in \mathbb{R} \mid x \neq 0\}$$

$$\frac{f}{g}(x) = \frac{f(x)}{g(x)} = \frac{\sqrt{x + \sqrt{x - x + x}}}{\sqrt{x - \sqrt{x - x + x}}} = \frac{\sqrt{1 + \sqrt{x - x + x}}}{\sqrt{1 - \sqrt{x - x + x}}}$$

$$\text{الف} \left\{ \left(-\frac{1}{2}, 1\right), (2, 2), \left(\frac{3}{2}, -1\right), \left(\frac{1}{2}, 1\right) \right\}$$

$$\text{ب} \left\{ (2, 2), (-2, 2), (\sqrt{2}, -1), (-\sqrt{2}, -1), (1, 2), (-1, 2) \right\}$$

$$\text{ج} \left\{ (-1, 1), (2, 2), (1, 3), (-1, 3), (-2, 2) \right\}$$

$$\text{د} \left\{ (1, -2), (2, -1) \right\}$$

$$h \left\{ (3, 2), (2, 1), (-2, 2) \right\}$$

$$\text{الف} \quad x \in \mathbb{Z} \quad g(x) = 0 \rightarrow g(x) + 1 = 0 + 1 = 1 \neq 0 \quad \checkmark$$

$$\text{ب} \quad x \notin \mathbb{Z} \quad g(x) = -1 \rightarrow g(x) + 1 = -1 + 1 = 0 \quad \checkmark$$

$$\{0, 1, 2\}$$

$$x_1 > 0 \quad x_2 > 0$$

$$11^2 x_1 - 11 x_2 > 0 \rightarrow 11^2 x_1 > 11 x_2$$

$$\rightarrow 11 x_1 > x_2 \rightarrow x_1 > \frac{x_2}{11}$$

$$\rightarrow x_1 > \frac{x_2}{11}$$

$$x_1 - x_2 \neq 0 \rightarrow x_1 \neq x_2$$

$$10 \neq \{2, 3, 4\}$$



$$-x^2 + 2x - 4 \leq 0 \quad \rightarrow \quad x^2 - 2x + 4 \geq 0 \quad \rightarrow \quad (x-1)^2 + 3 \geq 0$$

$\hookrightarrow (1) \quad \hookrightarrow (2)$

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

$$\begin{array}{c} \frac{1}{x-1} \\ \downarrow \\ \{1, 2, 3, 4\} \\ \downarrow \\ 0 \cdot 1 + 1 \cdot 2 + 0 \cdot 3 + (-1) \cdot 4 \\ \downarrow \\ 1 \cdot 2 - 1 + 4 \end{array}$$

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$$1) y = (x-1)^2 + 1 = y \Rightarrow (x-1)^2 = y-1 \Rightarrow x-1 = \sqrt{y-1} \Rightarrow x = 1 + \sqrt{y-1}$$

$$R_f = \mathbb{R}$$

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

$$(x-1)^2 = 1 + \frac{1}{y} \Rightarrow x-1 = \sqrt{1 + \frac{1}{y}} \Rightarrow 1 + \frac{1}{y} \geq 0 \Rightarrow \frac{1}{y} \geq -1 \Rightarrow y \leq -1 \Rightarrow R_f = (-\infty, -1)$$

$$3) y = x^2 - 4x + 10$$

$$x_u = -\frac{-f}{2a} = 2$$

$$y_{min} = (2)^2 - 4(2) + 10 = 4 \quad R_f = [4, +\infty)$$

$$4) 1 - x^2 + 4x + 3$$

$$x_u = -\frac{4}{2(-1)} = 2$$

$$y_{max} = -(2)^2 + 4(2) + 3 = 7 \quad R_f = (-\infty, 7]$$

$$5) x_u = \frac{f}{2a} = 2 \Rightarrow y_{min} = 4 - 16 + 3 = -9 \Rightarrow [-9, +\infty) \quad \sqrt{[-9, +\infty)} \Rightarrow R_f = [-, +\infty)$$

$$6) y = x^2 \quad x_u = -\frac{0}{2(1)} = 0 \Rightarrow y_{min} = -(0)^2 + 0 = 0 \quad \sqrt{[0, 9]} \Rightarrow R_f = [0, 3]$$

$$7) \mathbb{R}$$

$$8) \mathbb{R}$$

$$9) [0, +\infty)$$

$$10) [0, +\infty)$$

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

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

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