

$$\sqrt{x-F} = t \rightarrow f(x) = \sqrt{t^2 + F + Ft} = |t+F| \xrightarrow{x \geq 1} f(x) = t+F$$

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

$$\Rightarrow f(x) + g(x) = a + b\sqrt{x+C}$$

$$2t = 2\sqrt{x-F} = a + b\sqrt{x+C} \Rightarrow a=0, b=2, C=-F$$

$$-\frac{1}{F} = \frac{a+b}{C}$$

$$f(x) = \left\{ \left(0, \frac{2}{3}\right), \left(1, \frac{2}{3}\right), \left(2, -\frac{2}{3}\right), \left(3, -\frac{2}{3}\right) \right\}$$

$$\frac{g}{f} = \left\{ \left(0, \frac{2}{3}\right), \left(2, -\frac{1}{3}\right) \right\}$$

$$\text{الف) } f(2x) = \left\{ \left(-\frac{1}{2}, \frac{2}{3}\right), \left(\frac{1}{2}, \frac{2}{3}\right), \left(\frac{3}{2}, -\frac{2}{3}\right), \left(\frac{5}{2}, -\frac{2}{3}\right) \right\}$$

$$\text{ب) } f(x^2) = \left\{ \left(-1, \frac{2}{3}\right), \left(1, \frac{2}{3}\right), \left(-\sqrt{3}, -\frac{2}{3}\right), \left(\sqrt{3}, -\frac{2}{3}\right), \left(-2, -\frac{2}{3}\right), \left(2, -\frac{2}{3}\right) \right\}$$

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

$$\text{د) } \frac{2f}{g} = \left\{ \left(-1, \frac{2}{3}\right), \left(1, -\frac{2}{3}\right), \left(3, -\frac{1}{3}\right) \right\}$$

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

$$g(x) + 1 \neq 0 \rightarrow g(x) \neq -1 \rightarrow x \in \mathbb{Z}$$

$$f(x) = \sqrt{\frac{4x-x}{x-1}} \rightarrow \left. \begin{array}{l} 1) x \geq 0 \\ 2) x \neq 1 \end{array} \right\} D_f = \mathbb{W} - \{1\}$$

$$f(x) = \sqrt{-x^2 + 4x - 4} \rightarrow \frac{1}{-x+2} \rightarrow D_f = [1, 4] \rightarrow \{(1,0), (2, \sqrt{2}), (4,0)\}$$

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

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

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

$$R_f = \mathbb{R} - (-1, 0]$$

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$$\text{الف) } x_5 = 2 \rightarrow y_5 = 4 \rightarrow R_f = [4, +\infty)$$

$$\text{ب) } x_5 = 3 \rightarrow y_5 = 12 \rightarrow R_f = (-\infty, 12]$$

$$\text{ج) } x^2 - 4x - 3 \rightarrow x_5 = 2, y_5 = -7 \rightarrow R_f = [0, +\infty)$$

$$\text{د) } -x^2 + 4x \rightarrow x_5 = 3, y_5 = 9 \rightarrow R_f = [0, 3]$$

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$$\text{الف) } R_f = \mathbb{R}$$

$$\text{ب) } R_f = \mathbb{R}$$

$$\text{ج) } R_f = [0, +\infty)$$

$$\text{د) } R_f = [0, +\infty)$$

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$$\text{الف) } R_f = \mathbb{R} - \{3\}$$

$$\text{ب) } R_f = \mathbb{R} - \{2\}$$

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