

$$x=1 \rightarrow f(1)+g(1)=\sqrt{1+4\sqrt{1-4}}+\sqrt{1-4\sqrt{1-4}}=\sqrt{16}+\sqrt{0}=4$$

$$x=9 \rightarrow f(9)+g(9)=\sqrt{9+4\sqrt{9-4}}+\sqrt{9-4\sqrt{9-4}}=\sqrt{(2+\sqrt{5})^2}+\sqrt{(2-\sqrt{5})^2}=2+\sqrt{5}+2-\sqrt{5}=4$$

$$\left. \begin{aligned} a+b\sqrt{1+c} &= 4 \\ a+b\sqrt{9+c} &= 2\sqrt{5} \end{aligned} \right\} \ominus \Rightarrow b(\sqrt{1+c}-\sqrt{9+c})=2(2-\sqrt{5}) \quad |2+\sqrt{5}|+|2-\sqrt{5}|=4 \Rightarrow 2\sqrt{5}=2\sqrt{5}$$

$$\frac{a+b}{c} = \frac{0+2}{-4} = -\frac{1}{2} \quad b=2 \quad \sqrt{1+c}=\sqrt{4} \quad c=-4 \quad a+2\sqrt{1-4}=4 \quad a=0$$

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

$$g(x) = \left\{ (2, 1) (1, 0) (3, 5) (0, 4) \right\}$$

$$\frac{f}{g} = \left\{ (2, \frac{1}{5}) (0, 4) \right\}$$

$$الف) f(2x) = \left\{ (\frac{1}{2}, 2) (\frac{3}{2}, -1) (2, 2) (-\frac{1}{2}, 4) \right\}$$

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

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

$$د) \frac{f}{g} = \left\{ (1, -4) (3, -1) \right\}$$

$$h=2f+g = \left\{ (2, 5) (3, 5) (-2, 4) \right\}$$

$$D_f: \forall x > 0 \Rightarrow x > 0$$

$$\sqrt{3x} - x \geq 0 \Rightarrow x \leq \sqrt{3x} \Rightarrow x^2 - 3x \leq 0 \Rightarrow x(x-3) \leq 0$$

$$x \neq 1$$

$$\begin{array}{c|c} & x \\ \hline + & 0 \\ - & 3 \end{array}$$

$$\frac{f(x)}{g(x)+1} \rightarrow \frac{\sqrt{3x}-x}{(x-1)([x]+[-x]+1)}$$

$$x \neq 1 \quad x \in \mathbb{Z}$$

$$D = \{0, 1, 3\}$$

$$f(x) = \sqrt{5x - x^2 - 2} \rightarrow (x^2 - 5x + 2) \geq 0 \quad \begin{array}{|c|c|c|} \hline & 1 & 2 \\ \hline & -4 & +4 \\ \hline \end{array}$$

$$g(x) = \{(1, 2), (2, 2), (3, 4), (4, 1)\}$$

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

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الف) $R_f = \mathbb{R}$

ب) $yx^2 - 2yx = 1$

$(y)x^2 - 2y)x(-1) = 0$

$\Delta = (-2y)^2 - 4(y)(-1) = 4y^2 + 4y$

$y = \frac{+2y \pm \sqrt{4y^2 + 4y}}{2y}$

$4y^2 + 4y \geq 0$

$4y^2 + y \geq 0$

$y(y+1) \geq 0$

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

$\begin{array}{|c|c|c|} \hline & -1 & 0 \\ \hline & + & - \\ \hline \end{array}$

الف) $y = x^2 - 5x + 10$

$x_s = \frac{+5}{2} = 2.5$

$y_s = 2.5^2 - 5(2.5) + 10 = 4$

$R_f = [4, +\infty)$

ب) $y = -x^2 + 4x + 3$

$x_s = \frac{-4}{-2} = 2$

$y_s = -2^2 + 4(2) + 3 = 7$

$R_f = (-\infty, 7]$

ج) $\sqrt{x^2 - 5x - 3}$

$x_s = \frac{5}{2} = 2.5$

$y_s = 2.5^2 - 5(2.5) - 3 = -4$

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

د) $\sqrt{-x^2 + 4x}$

$x_s = \frac{-4}{-2} = 2$

$y_s = -2^2 + 4(2) = 4$

$R_f = [0, 4]$

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الف) $y = x^3 - 5x^2 + 2x + 1$

$R_f = \mathbb{R}$

ب) $y = x^3 - 6x^2 + 3x + 2$

$R_f = \mathbb{R}$

ج) $y = \sqrt{x^3 - 6x^2 + 5x + 1}$

$R_f = [0, +\infty)$

د) $y = (x^3 - 5x^2 + 2x + 1)^2$

$R_f = \mathbb{R}$

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الف) $y = \frac{3x+1}{x-2}$

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

ب) $y = \frac{2x+1}{x+1}$

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

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