

$$\begin{aligned} f(x) &= \sqrt{x+1} \sqrt{x-3} = \sqrt{(\sqrt{x-3}+1)^2} = \sqrt{x-3} + 1 \\ g(x) &= \sqrt{x-1} \sqrt{x-3} = \sqrt{(\sqrt{x-3}-1)^2} = \sqrt{x-3} - 1 \end{aligned}$$

$$f(x) + g(x) = \sqrt{x-5} + y + \sqrt{x-5} - y = y\sqrt{x-5} = a + b\sqrt{x+c}$$

$$\begin{aligned} a &= 0 \\ b &= y \\ c &= -5 \end{aligned} \quad \frac{a+b}{c} = \frac{y}{-5} = \left(-\frac{1}{5}\right)$$

$$g(x) = \{(1,1), (1,0), (1,0), (0,1)\}$$

$$f(x) = \frac{x+1}{x^2-5x+3} = \frac{x+1}{(x-1)(x-3)}$$

$$x \neq 1$$

$$x \neq 3$$

$$D_f = R - \{1, 3\}$$

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

$$\frac{1}{-2}$$

$$\frac{1}{1}$$

$g(x) = \{(-2, 3)(1, -1), (3, 2), (-1, 0)\}$ $f(x) = \{(1, 2)(3, -1)(9, 2), (-6, 4)\}$
 $\Rightarrow f(g(x)) = \{(1, 2)(3, -1)(9, 2)(-6, 4)\}$ $g(f(x)) = \{(-2, 3)(1, -1)(3, 2)(-1, 0)\}$
 $\Rightarrow f(g(x)) \neq g(f(x))$
 $\Rightarrow f \circ g \neq g \circ f$
 $\Rightarrow f$ und g sind nicht kommutativ.

$$\Rightarrow \frac{1}{g} = \left\{ (1, -\epsilon), (4, -1), \left(-1, \frac{1}{g} \right) \right\}$$

$$f(x) = \{(1,1), (2,1), (3,9), (-4,0)\} \quad g(x) = \{(0,1), (2,3), (-2,6), (-1,2), (3,3)\}$$

$$f \circ g(x) = \{(2,2), (3,6), (6,18), (-2,0)\}$$

$$h(x) = \{(x, a)(x, a)(-x, c)\}$$

$$f(x) = \frac{\sqrt{4x} - x}{x-2} \quad \begin{aligned} &\forall x \geq 0 \\ &x \geq 0 \\ &\sqrt{4x} - x \geq 0 \\ &\sqrt{4x} \geq x \\ &\forall x \geq x^2 \\ &x^2 - 4x \leq 0 \\ &x(x-4) \leq 0 \end{aligned}$$

$$g(x) = [x] + [-x]$$

$$\left(\frac{f}{g+1} \right)(x) = \frac{\sqrt{4x} - x}{[x] + [-x] + 1}$$

$$x \neq 2 \quad [x] + [-x] \neq -1$$

به ازای اعداد صحیح -1 است

$$D\left(\frac{f}{g+1}\right) = \{x \mid 0 \leq x \leq 4, x \neq 2, x \in \mathbb{Z}\}$$

$$\begin{array}{r} 0 \quad 3 \\ +6-9+ \end{array}$$

$$f(x) = \sqrt{x^2 + 5x + 4} \quad g(x) = \{(1, 3), (2, 2), (4, 9), (5, 1)\}$$

$$\downarrow$$

$$\sqrt{-(x^2 - 5x + 4)}$$

$$\downarrow$$

$$\sqrt{(1-x)(x-4)}$$

$$\frac{1}{-b \pm \sqrt{b^2 - 4ac}}$$

$$Pf \Rightarrow [1, 4]$$

$$h(x) = \frac{f}{g} = \left\{ \left(1, \frac{3}{1}\right), \left(2, \frac{1}{2}\right), \left(4, \frac{9}{4}\right), \left(5, \frac{1}{5}\right) \right\}$$

$$f(1) = 0$$

$$f(2) = \sqrt{2}$$

$$f(4) = 0$$

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$$y = x^3 - 2x^2 + 3x \rightarrow y = x^3 - 2x^2 + 3x + 1 - 1$$

$$y = (x-1)^3 + 1$$

$$y-1 = (x-1)^3 \quad x = \sqrt[3]{y-1} + 1$$

$$y = \frac{1}{x^2 - 2x}$$

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$$yx^2 - 2yx - 1 = 0$$

$$y \neq 0 \rightarrow x = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y}$$

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

$$4y(y+1) \geq 0 \quad \frac{-1}{4} \leq y \leq 0$$

$$g \rightarrow (-\infty, -1] \cup (0, +\infty)$$

$$الف) y = x^2 - 4x + 1$$

$$ص) \begin{cases} \frac{-b}{2a} = \frac{4}{2} = 2 \\ \Delta \min \end{cases} \quad g \rightarrow [4, +\infty)$$

$$ب) y = -x^2 + 4x + 3$$

$$ص) \begin{cases} \frac{-b}{2a} = \frac{-4}{-2} = 2 \\ \Delta \max \end{cases} \quad g \rightarrow (-\infty, 12]$$

$$ج) y = \sqrt{x^2 - 4x + 4}$$

$$ص) \begin{cases} \frac{-b}{2a} = \frac{4}{2} = 2 \\ -\Delta \min \end{cases} \quad \sqrt{[-4, +\infty)} \rightarrow g \rightarrow [0, +\infty)$$

$$د) y = \sqrt{-x^2 + 4x}$$

$$ص) \begin{cases} \frac{-b}{2a} = \frac{-4}{-2} = 2 \\ \Delta \max \end{cases} \quad \sqrt{(-\infty, 4]} \rightarrow g \rightarrow [0, 4]$$

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$$الف) y = x^3 - 5x^2 + 2x + 1 \rightarrow \text{بزرگترین توان فرد} \rightarrow g \rightarrow \mathbb{R}$$

$$ب) y = x^4 - 4x^3 + 3x^2 + 2 \rightarrow \text{بزرگترین توان فرد} \rightarrow g \rightarrow \mathbb{R}$$

$$ج) y = \sqrt{x^4 - 4x^3 + 3x^2 + 1} \rightarrow \text{بزرگترین توان فرد} \rightarrow g \rightarrow \sqrt{\mathbb{R}} \rightarrow [0, +\infty)$$

$$د) y = (x^5 - 4x^4 + 3x^3 + 1)^2 \rightarrow \text{بزرگترین توان فرد} \rightarrow g \rightarrow (\mathbb{R})^2 \rightarrow [0, +\infty)$$

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$$الف) y = \frac{3x+1}{x-2} \quad x = -\frac{-2y-1}{y-3} = \frac{2y+1}{y-3} \quad g \rightarrow (\mathbb{R} - \{3\})$$

$$ب) y = \frac{2x+1}{x+1} \quad x = -\frac{y-1}{y-2} = \frac{1-y}{y-2} \quad g \rightarrow (\mathbb{R} - \{2\})$$

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