

$$f(x) = \left(\frac{1}{x}\right)^{x+2} - 1 \rightarrow (x)^{-x+2} - 1$$

$$f(x+1) = x^{-x+1} - 1$$

		+	+	-
$x^{-x+1} - 1$		-	+	+
x^3		-	+	-

$$Z.F: [0, 1]$$

$$y = \sqrt{x^3 f(x+1)} = \sqrt{x^3 ((x)^{-x+1} - 1)} \quad x^3 ((x)^{-x+1} - 1) \geq 0 \quad \begin{cases} x^3 = 0 \rightarrow x = 0 \\ x^{-x+1} = 1 \rightarrow -x+1 = 0 \rightarrow x = 1 \end{cases}$$

$$f(-x) = \sqrt{-x+1-x+2}$$

$$\begin{cases} x \geq 2 \rightarrow \sqrt{-x+2-x} \rightarrow \sqrt{2-2x} & 2-2x \geq 0 & 1 \geq x \text{ ①} \end{cases}$$

$$\begin{cases} x < -2 \rightarrow \sqrt{-x+x-2} \rightarrow \sqrt{-2} \text{ ②} \end{cases}$$

$$\text{①} \cap \text{②} = (-\infty, 1]$$

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$$\begin{aligned} \frac{x-1}{f(x)} &\geq 0 \\ \rightarrow x=1 \\ \rightarrow x=3 \\ \rightarrow x=2 \\ \rightarrow x=-1 \end{aligned}$$

	-1	1	2	3
$x-1$	-	-	+	+
$f(x)$	+	-	-	+
	-	+	-	+

$$D: (-1, 1] \cup (2, 3)$$

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$$\frac{9x^2 - 4x^2 - 4x - 3}{x^2 - x - 3} \quad \frac{5x^2 + x + 1}{x^2 - x - 3}$$

$$(5x^2 + x + 1)(x^2 - x - 3) = 9x^2 - 4x^2 - 4x - 3$$

$$5x^2 - x - 3 = 5x^2 + ax + b$$

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$$\begin{cases} a = -1 \\ b = -3 \end{cases} \rightarrow \sqrt{-(-1-3)} = 2$$

$$y = \sqrt{f(x) - f\left(\frac{x}{2}\right)} = \sqrt{x^2 + x - \frac{4x}{x^2} - \frac{x}{x}} = \sqrt{\frac{x^4 + x^3 - 4x - x}{x^2}} = \sqrt{\frac{(x^2 + 2x + 4)(x^2 - 1)}{x^2}}$$

$$\frac{(x^2 + 2x + 4)(x^2 - 1)}{x^2} \geq 0 \quad \begin{aligned} &\rightarrow x = -2 \\ &\rightarrow x = 0 \end{aligned}$$

	-2	0	2
$x^2 - 1$	+	-	+
x^2	-	-	+
	-	+	+

$$Z.F: [-2, 0) \cup [2, +\infty)$$

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$$x^2 + x = 2 \rightarrow x^2 + x - 2 = 0 \rightarrow x = 1$$

$$x^2 + x = 1 \rightarrow x^2 + x - 1 = 0 \rightarrow x = 2$$

$$f(x) = x(1)^2 - 1 = 1$$

$$f(x) + f(1) = 1 + 1 = 2$$

$$f(1) = x(1)^2 - 1 = 1$$

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$$f(x) = (x^2 - 4x^2 + 12x - 1) + 1 = (x - 2)^2 + 1$$

$$g(x) = (x^2 + 9x^2 + 22x + 22) - 22 = (x + 2)^2 - 22$$

$$\frac{g(\sqrt{2} - 2)}{f(\sqrt{2} + 2)} = \frac{(\sqrt{2} - 2)^2 - 22}{(\sqrt{2} + 2)^2 + 1} = \frac{2 - 22}{2 + 1} = \frac{-20}{3} = -\frac{20}{3}$$

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

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

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

$$2\sqrt{x - 2} = a + b\sqrt{x} + c \quad \begin{cases} a = 0 \\ b = 2 \\ c = -2 \end{cases} \quad \frac{a+b}{c} = \frac{0+2}{-2} = -1$$

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

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

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

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$$ا) \left\{ (\frac{1}{2}, 2), (\frac{3}{2}, -1), (2, 2), (\frac{1}{2}, 4) \right\}$$

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

$$ج) \left\{ (-2, 9), (1, 3), (3, 9), (-1, 1) \right\}$$

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

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