

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

$$g(x) = \sqrt{x-1} \sqrt{x-1} \rightarrow \sqrt{t^2 \cdot t^2 + 1} \rightarrow \sqrt{(t^2)^2 + 1} \rightarrow t^2 + 1$$

$$f(x) = \sqrt{t^2 + 1} \sqrt{t^2 + 1} \rightarrow \sqrt{(t^2 + 1)^2} = t^2 + 1$$

$$f(x), g(x) \leq t^2 + 1 \leq t^2 + 1 \leq t^2 + 1 \rightarrow 2\sqrt{x-1} = a + b\sqrt{x-1} \rightarrow a=2, b=1, c=0$$

$$\frac{a+b}{c} = \frac{2+1}{-1} = -3 \checkmark$$

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

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

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

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

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$$f(x) = \left[(1, 2) \left(\sqrt{3}, -1 \right) \left(2, 2 \right) \right]$$

$$x=1 \rightarrow x=1$$

$$x=3 \rightarrow x=3$$

$$x=5 \rightarrow x=5$$

$$g(x) = 2g(x) + 1 = \left[(-2, 1) (1, 2) (3, 2) (-1, 1) \right]$$

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

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$$f(x) = \left[(2, 2) (3, 2) (4, 1) (-2, 0) \right]$$

$$h = f \circ g = \left[(2, 0) (3, 2) (-2, 1) \right]$$

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$$f(x) = \frac{\sqrt{x^2-1}}{x-1} \Rightarrow x-1 \neq 0 \rightarrow x \neq 1, \sqrt{x^2-1} \geq 0 \rightarrow x \geq 1$$

$$\sqrt{x^2-1} \geq 0 \rightarrow \sqrt{x^2-1} \geq x \rightarrow x^2-1 \geq x^2 \rightarrow x(x-1) \leq 0$$

$$D_f = [0, 1] \cup [1, \infty)$$

$$\left(\frac{f}{g+1} \right)(x) \rightarrow D_f = \{0, 1, 2\} \checkmark$$

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$$g \begin{cases} x \in \mathbb{Z} \rightarrow 0 \\ x \notin \mathbb{Z} \rightarrow -1 \end{cases}$$

Arman

$$f(x) = \sqrt{-2x^2 + 4x - 5} \rightarrow x^2 - 2x + \frac{5}{2} \rightarrow (x-1)(x-5) \leq 0$$

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$$h(x) = \frac{f(x)}{g(x)} = \frac{\sqrt{-2x^2 + 4x - 5}}{x^2 - 2x + 1} \rightarrow \frac{1}{x-1} \rightarrow D_f = [1, 5]$$

$$\text{الف) } y = x^3 - 3x^2 + 3x \rightarrow (x-1)^3 + 1 \rightarrow y-1 = (x-1)^3 \rightarrow \sqrt[3]{y-1} + 1 = x \rightarrow R = \mathbb{R} \checkmark$$

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$$\text{ب) } y = \frac{1}{x^2 - 2x} \rightarrow yx^2 - 2yx - 1 = 0 \rightarrow x = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y}$$

$$2y \neq 0 \rightarrow y \neq 0$$

$$4y^2 + 4y \geq 0 \rightarrow y(y+1) \geq 0 \rightarrow R = (-\infty, -1] \cup (0, +\infty) \checkmark$$

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$$\text{الف) } y = x^2 - 4x + 1 \rightarrow \min \left| \frac{-b}{2a} = \frac{4}{2} = 2 \right| \rightarrow R = [4, +\infty) \checkmark$$

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$$\text{ب) } y = -x^2 + 4x + 1 \rightarrow \max \left| \frac{-b}{2a} = \frac{4}{-2} = -2 \right| \rightarrow R = (-\infty, 13] \checkmark$$

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$$\text{ج) } y = \sqrt{x^2 - 4x + 1} \rightarrow \min \left| \frac{-b}{2a} = \frac{4}{2} = 2 \right| \rightarrow R = [-1, +\infty) \rightarrow [0, +\infty) \checkmark$$

$$\text{د) } y = \sqrt{4x - x^2} \rightarrow \max \left| \frac{-b}{2a} = \frac{4}{-2} = -2 \right| \rightarrow R = [-2, 2] \rightarrow [0, 2] \checkmark$$

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$$\text{الف) } y = x^2 - 2x + 1 \rightarrow R = \mathbb{R} \checkmark$$

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$$\text{ب) } y = x^2 - 2x + 1 \rightarrow R = \mathbb{R} \checkmark$$

$$\text{ج) } y = \sqrt{x^2 - 2x + 1} \rightarrow R = [0, +\infty) \checkmark$$

$$\text{د) } y = (x^2 - 2x + 1)^2 \rightarrow R = \mathbb{R} \checkmark \rightarrow R = [0, +\infty)$$

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$$\text{الف) } y = \frac{x+1}{x-2} \rightarrow R = \mathbb{R} \setminus \{2\} \checkmark$$

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$$\text{ب) } y = \frac{x+1}{x+1} \rightarrow R = \mathbb{R} \setminus \{-1\} \checkmark$$

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$$f_{(2n)} = \left\{ \left(\frac{1}{2}, 2 \right) \left(\frac{\sqrt{2}}{2}, -1 \right) (2, 2) \left(-\frac{1}{2}, 4 \right) \right\} \quad n \text{ های } f \text{ باید حقیق نباشند!} \quad (3)$$

$$f_{(2)} = \left\{ (1, 2) (-1, 2) (\sqrt{2}, -1) (-\sqrt{2}, -1) (2, 2) (-2, 2) \right\} \quad \text{هرکدام از } n \text{ های } f \text{ را برابر } 2 \text{ قرار دهیم!}$$

$$g_{(n)} + 1 = \left\{ (-2, 19) (1, 3) (3, 9) (-1, 1) \right\} \quad \text{این عمل روی } y \text{ های } g \text{ اعمال می‌شود:}$$

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