

$$f(x) = \sqrt{x+4}\sqrt{x-4} \quad g(x) = \sqrt{x-4}\sqrt{x-4}$$

$$\rightarrow [f(x) + g(x)]^2 = x+4\sqrt{x-4} + x-4\sqrt{x-4} + 4\sqrt{x^2-16(x-4)} =$$

$$2x + 4\sqrt{x^2-16x+64} = 2x + 4\sqrt{(x-4)^2} = 2x + 4(x-4) = 2x + 4x - 16 =$$

$$6x - 16 \rightarrow f(x) + g(x) = \sqrt{6x-16} = \sqrt{2(x-4)} = \sqrt{2}\sqrt{x-4}$$

$$a+b\sqrt{x+c} = \sqrt{2}\sqrt{x-4} \rightarrow \frac{a+b}{\sqrt{2}} = \sqrt{x-4}$$

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$$f(x) = \frac{x+2}{x^2-4x+4} \rightarrow (2, -4), (1, \frac{1}{2}), (3, \frac{1}{2}), (0, \frac{1}{2})$$

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

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

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

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

ج) $2g^2(x) + 1$
 $\{(-2, 19), (1, 13), (3, 9), (-1, 1)\}$

د) $\frac{2f}{g}$
 $\{(1, -4), (3, -1)\}$

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

$$g(x) = \{(5, 1), (2, 3), (-2, 4), (-1, 2), (3, 3)\}$$

$$h = 2f + g$$

$$\rightarrow h = \{(2, 5), (3, 5), (-2, 4)\}$$

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$$f(x) = \frac{\sqrt{3x} - x}{x-2} \quad g(x) = [x] + [-x]$$

$$\left(\frac{f}{g+1}\right)(x) = \frac{f(x)}{g(x)+1}$$

۱- دایره‌های به هم می‌زنند
 ۲- دایره‌های به هم می‌زنند
 ۳- دایره‌های به هم می‌زنند

$x \neq 2$
 $3x \geq 0 \rightarrow x \geq 0$
 $\sqrt{3x} - x \geq 0 \rightarrow x \leq \sqrt{3x} \rightarrow -3x \leq x^2 \leq 3x$
 $\rightarrow -3 \leq x \leq 3$

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$g(x) = \{(1, 1^3), (2, 2^3), (4, 4^3), (5, 1^3)\}$ $f(x) = \sqrt{5x - x^2 - 4} \rightarrow (1, 0), (2, \sqrt{2}), (4, 0), (5, \text{مردود})$ $h(x) = \frac{f(x)}{g(x)} \rightarrow h(x) = \{(1, 0), (2, 1), (4, 0)\}$ $\rightarrow h(x) = \{(1, 0), (2, \frac{\sqrt{2}}{2}), (4, 0)\}$				6
الف) $y = x^3 - 3x^2 + 3x$ $\rightarrow y = x^3 - 3x^2 + 3x - 1 + 1$ $y = (x-1)^3 + 1$ $\rightarrow y-1 = (x-1)^3$ $\rightarrow \sqrt[3]{y-1} = x-1 \rightarrow x = \sqrt[3]{y-1} + 1$ $\rightarrow \mathbb{R}$	ب) $y = \frac{1}{x^2 - 2x}$ $\rightarrow yx^2 - 2yx = 1$ $\rightarrow yx^2 - 2yx - 1 = 0$ $b^2 - 4ac \rightarrow 4y^2 - 4(y)(-1) = 4y^2 + 4y$ $\rightarrow 4y^2 + 4y > 0 \rightarrow y^2 + y > 0$ $y(y+1) > 0 \rightarrow \frac{-1 \pm \sqrt{1+4}}{2} \rightarrow (-\infty, -1] \cup (0, +\infty)$			7
الف) $y = x^2 - 4x + 1$ $\rightarrow ! \geq \min$ $\rightarrow \frac{4ac - b^2}{4a} = c - \frac{b^2}{4a}$ $1 - \frac{16}{4 \times 1} = 1 - 4 = -3$ $[4, +\infty)$	ب) $y = -x^2 + 4x + 1$ $\rightarrow ! \geq \max$ $\rightarrow \frac{4ac - b^2}{4a} = c - \frac{b^2}{4a}$ $1 - \frac{16}{-4} = 1 - (-4) = 5$ $1 + 4 = 5$ $(-\infty, 5]$	ج) $y = \sqrt{x^2 - 4x - 3}$ $\rightarrow c - \frac{b^2}{4a} = -3 - \frac{16}{4} = -7$ $-3 - 4 = -7 \geq \min$ $\rightarrow [-7, +\infty)$ $\rightarrow [0, +\infty)$	د) $y = \sqrt{4x - x^2}$ $\rightarrow y = -x^2 + 4x$ $! \geq \max$ $c - \frac{b^2}{4a} = 0 - \frac{16}{-4} = 4$ $0 - (-4) = 4 \rightarrow (-\infty, 4]$ $\rightarrow [0, 4]$	8
الف) $y = x^3 - 5x^2 + 2x + 1$ نبره‌های توان فرد است $\mathbb{R}$	ب) $y = x^4 - 4x^2 + 3x + 2$ نبره‌های توان فرد است $\mathbb{R}$	ج) $y = \sqrt{x^2 - 4x^2 + 5x + 1}$ $\rightarrow \sqrt{1x} \rightarrow [0, +\infty)$ $\rightarrow [0, +\infty)$	د) $y = (x^3 - 4x^2 + 3x + 1)^2$ $\rightarrow \mathbb{R}^+$ $\rightarrow [0, +\infty)$	9
الف) $y = \frac{3x+1}{x-2}$ $\rightarrow \mathbb{R} - \{\text{ممنوعه}\} = \mathbb{R} - \{\frac{a}{c}\} = \mathbb{R} - \{\frac{1}{2}\}$ $\rightarrow \mathbb{R} - \{2\}$	ب) $y = \frac{2x+1}{x+1}$ $\mathbb{R} - \{\frac{a}{c}\} = \mathbb{R} - \{\frac{1}{1}\}$ $\rightarrow \mathbb{R} - \{1\}$			10