

$$f(x) = \sqrt{x+4}\sqrt{x-4} \quad g(x) = \sqrt{x-4}\sqrt{x-4} \quad (f(x)+g(x)=a+b\sqrt{x+c})^2 \rightarrow$$

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

$$2x + 2(\sqrt{x^2-16x+64}) = 2x + 2(\sqrt{(x-4)^2}) \xrightarrow{\text{چون } x \geq 4} 2x + 2x - 16 \rightarrow$$

$$4x - 16 \xrightarrow{\text{تقسیم در دو طرف}} \sqrt{4x-16} = \sqrt{4(x-4)} = 2\sqrt{x-4} \xrightarrow{\text{مقایسه با } a+b\sqrt{x+c}} \frac{a+b}{c} = \frac{2}{-4} = \left[\frac{-1}{2}\right]$$

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

$$f(x) = \{(2,-4)(1,\frac{3}{0})(3,\frac{5}{0})(0,\frac{2}{3})\}$$

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

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

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

$$f(x^2) = \{(1,2)(-1,2)(\sqrt{4}, -1)(-\sqrt{4}, -1)(2,2)(-2,2)\}$$

$$fg(x)+1 = \{(-2,19)(1,4)(3,9)(-1,1)\}$$

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

$$f(x) = \{(2,1)(3,1)(4,9)(-2,0)\} \quad g(x) = \{(5,1)(2,3)(-2,4)(-1,2)(3,3)\}$$

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

$$f(x) = \frac{\sqrt{3x-x}}{x-2} \quad g(x) = [x] + [-x] \rightarrow \text{به ازای } x \text{ صحیح می شود و به ازای بقیه 1- می شود}$$

$$\left(\frac{f}{g+1}\right)(x) = \frac{\sqrt{3x-x} \rightarrow [0,4]}{x-2 \rightarrow \mathbb{R}-\{2\}} \bigwedge \{0,1,3\}$$

$$\frac{[x]+[-x]+1}{x-2} \rightarrow \mathbb{Z}$$

$$\sqrt{3x-x} \geq 0, \sqrt{3x-x} \leq 0 \rightarrow \frac{0}{-1+1} \rightarrow [0,4]$$

$$\downarrow$$

$$[0,+\infty)$$

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| $f(x) = \sqrt{\Delta x - x^2 - 4} \quad g(x) = \{(1, 2)(2, 2)(4, 4)(5, 1)\}$ $h(x) = \frac{f(x)}{g(x)} \rightarrow \{(1, 0)(2, \frac{\sqrt{2}}{2})(4, 0)(5, \sqrt{-4})\}$ $f(x) = \{(1, 0)(2, \sqrt{2})(4, 0)(5, \sqrt{-4})\}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ۶  |
| $y = x^2 - 4x^2 + 4x \leftarrow \text{چون برکتینه توان فزایش} \rightarrow R_f = \mathbb{R}$ $y = \frac{1}{x^2 - 2x} \Rightarrow \frac{y}{a}x^2 - \frac{2y}{b}x - \frac{1}{c} = 0 \rightarrow \Delta = 4y^2 + 4y \begin{matrix} \uparrow \\ \text{چون میوه زیر رادیکال} \end{matrix} \geq 0 \rightarrow 4y(y+1) \geq 0 \rightarrow$ $\frac{-1}{+} \frac{0}{-} \frac{+}{+} \rightarrow (-\infty, -1] \cup [0, +\infty)$                                                                                                                                                                                                                                                                                             | ۷  |
| $y = x^2 - 4x + 10 \rightarrow \text{اول } x = \frac{-b}{2a} = \frac{4}{2} = 2 \xrightarrow{\text{جایگذاری}} y = 9 \rightarrow R_f = [9, +\infty) \text{ (الف)}$ $y = -x^2 + 4x + 4 \rightarrow \text{اول } x = \frac{-b}{2a} = \frac{-4}{-2} = 2 \xrightarrow{\text{جایگذاری}} y = 12 \rightarrow (-\infty, 12] \text{ (ب)}$ $y = \sqrt{9x - x^2} \rightarrow \text{اول } x = \frac{-b}{2a} = \frac{-9}{-2} = 4.5 \rightarrow \text{اول } y = 9 \rightarrow \sqrt{(-\infty, 9]} \rightarrow [0, 3] \text{ (د)}$ $y = \sqrt{x^2 - 4x - 4} \rightarrow \text{اول } x = \frac{-b}{2a} = \frac{4}{2} = 2 \xrightarrow{\text{جایگذاری}} y = -7 \rightarrow \sqrt{[-7, +\infty)} \rightarrow [0, +\infty) \text{ (ج)}$ | ۸  |
| $y = x^3 - 6x^2 + 2x + 1 \rightarrow \mathbb{R}$ $y = x^5 - 4x^2 + 3x + 2 \rightarrow \mathbb{R}$ $y = \sqrt{x^5 - 4x^2 + 3x + 2} \rightarrow \sqrt{\mathbb{R}} = [0, +\infty)$ $y = (x^5 - 4x^2 + 3x + 1)^2 \rightarrow (\mathbb{R})^2 = [0, +\infty)$                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ۹  |
| $y = \frac{3x+1}{x-2} \xrightarrow{\text{با توجه به روش اول و دوم}} x = -\frac{-2y-1}{y-3} \rightarrow x = \frac{2y+1}{y-3} \rightarrow R_f = \mathbb{R} - \{3\}$ $y = \frac{2x+1}{x+1} \rightarrow x = -\frac{y-1}{y-2} = \frac{1-y}{y-2} \rightarrow R_f = \mathbb{R} - \{2\}$                                                                                                                                                                                                                                                                                                                                                                                                                                  | ۱۰ |