

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

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

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

$$x \geq 2$$

$$\begin{matrix} a=0 \\ b=2 \\ c=2 \end{matrix}$$

$$\frac{a+b}{c} = \frac{0+2}{2} = 1$$

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

بیمای ف (3) است پس
این نقاط بحرانی می شود

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

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

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

$$f(x) = \left\{ (1, 2) (3, 1) (5, 2) (-1, 2) \right\}$$

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

$$f(2x) = 2x+2 \Rightarrow \boxed{x=1} \rightarrow f(2x) = \left\{ \left(\frac{1}{2}, 2 \right) \left(\frac{3}{2}, 1 \right) \left(\frac{5}{2}, 2 \right) \left(-\frac{1}{2}, 2 \right) \right\}$$

$$f(x^2) = x^2+2 \Rightarrow x^2=2 \Rightarrow x=\pm\sqrt{2} \rightarrow f(x^2) = \left\{ (1, 2) (-1, 2) (\sqrt{2}, 1) (-\sqrt{2}, 1) (2, 2) (-2, 2) \right\}$$

$$2g^2(x)+1 \Rightarrow g^2(x) = \left\{ (-2, 4) (1, 1) (2, 4) (-1, 0) \right\} \Rightarrow 2g^2(x) = \left\{ (-2, 8) (1, 2) (2, 8) (-1, 0) \right\}$$

$$2g^2(x)+1 = \left\{ (-2, 8) (1, 2) (2, 8) (-1, 0) \right\}$$

$$2f \Rightarrow 2f = \left\{ (1, 4) (3, 2) (5, 4) (-1, 2) \right\}$$

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

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

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$$f(x) = \{(2,1)(3,1)(4,9)(-2,0)\} \Rightarrow 2f(x) = \{(2,2)(3,2)(4,18)(-2,0)\}$$

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

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

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

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

(II)

$$x \in \mathbb{Z} \rightarrow 0$$

$$x \notin \mathbb{Z} \rightarrow -1$$

(I)

$$① \quad x \in \mathbb{Z}$$

$$② \quad \sqrt{x} - x \leq 0 \Rightarrow \sqrt{x} \leq x \Rightarrow x \geq 1$$

$$③ \quad x \neq 1$$

$$① \cap ② \cap ③ \Rightarrow [0, 1] - \{1\}$$

$$\left[\frac{f}{g+1} \right](x) \Rightarrow \frac{f(x)}{g(x)+1} \xrightarrow{(I) \cap (II)} D = \{0, 1, 2\}$$

$$x \in \mathbb{Z} \text{ و } x \neq 1$$

دامنه تابع f

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

$$\sqrt{-(x^2 - \omega x + 4)} \Rightarrow \sqrt{-(x-1)(x-4)} \quad \frac{1}{-x+4} \Rightarrow R_f = [1, 4]$$

$$h(x) = \frac{f(x)}{g(x)} \Rightarrow \left\{ \left(1, \frac{0}{2}\right), \left(2, \frac{\sqrt{2}}{2}\right), \left(3, \frac{0}{4}\right) \right\} \Rightarrow \left\{ (1,0), \left(2, \frac{\sqrt{2}}{2}\right), (3,0) \right\}$$

$$y = x^2 - 2x^2 + 3x \Rightarrow y = (x-1)^2 + 1 \Rightarrow (x-1)^2 = y-1 \Rightarrow x-1 = \sqrt{y-1} \Rightarrow x = \sqrt{y-1} + 1$$

$$y = \frac{1}{x^2 - 2x} \Rightarrow x^2 - 2x = \frac{1}{y} \Rightarrow (x-1)^2 - 1 = \frac{1}{y} \Rightarrow (x-1)^2 = \frac{1+y}{y} \Rightarrow x-1 = \sqrt{\frac{1+y}{y}} \Rightarrow$$

$$x = \sqrt{\frac{1+y}{y}} + 1 \rightarrow y \neq 0$$

$$\frac{1+y}{y} \geq 0 \Rightarrow \frac{1}{y} \geq -1 \Rightarrow R_f = \mathbb{R} - (-1, 0]$$



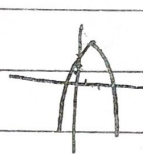
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(1)

الف) $y = x^2 - 2x + 1$ $\Rightarrow$ $\begin{array}{c|c} -b & \frac{b}{a} \\ \hline 2 & 1 \end{array}$ $\Rightarrow$ $\begin{array}{c} \text{Min} \\ y = 0 \end{array}$ $\Rightarrow$ $R_f = [0, +\infty)$



ب) $y = -x^2 + 4x + 3$ $\Rightarrow$ $\begin{array}{c|c} -b & \frac{b}{a} \\ \hline 4 & -1 \end{array}$ $\Rightarrow$ $\begin{array}{c} \text{Max} \\ y = 7 \end{array}$ $\Rightarrow$ $R_f = (-\infty, 7]$



ج) $y = \sqrt{x^2 - 4x + 5}$ $\Rightarrow$ $\begin{array}{c|c} -b & \frac{b}{a} \\ \hline 2 & 1 \end{array}$ $\Rightarrow$ $\begin{array}{c} \text{Min} \\ y = 1 \end{array}$ $\Rightarrow$ $R_f = [1, +\infty) \Rightarrow [0, +\infty)$

د) $y = \sqrt{-x^2 + 4x}$ $\Rightarrow$ $\begin{array}{c|c} -b & \frac{b}{a} \\ \hline 2 & -1 \end{array}$ $\Rightarrow$ $\begin{array}{c} \text{Max} \\ y = 2 \end{array}$ $\Rightarrow$ $R_f = (-\infty, 2] \Rightarrow [0, 2]$

الف) $R_f = \mathbb{R}$

ب) $R_f = \mathbb{R}$

ج) $R_f = \sqrt{\mathbb{R}} \Rightarrow R_f = [0, +\infty)$

د) $R_f = (\mathbb{R})^2 \Rightarrow R_f = [0, +\infty)$

(9)

الف) $y = \frac{x+1}{x-2} \Rightarrow R_f = \mathbb{R} - \{2\}$

$R_f = \mathbb{R} - \{2\} \leftarrow$ د توابع معکوس یافتنی نیست

(b)

ب) $y = \frac{x+1}{x+1} \Rightarrow R_f = \mathbb{R} - \{1\}$