

۲. آخرین به سبب

زیرمسابقات مسی

SUBJECT:

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$$f(x) = \sqrt{x+4}\sqrt{x-4} + 2 - 2 \rightarrow f(x) = \sqrt{x-4} + 2\sqrt{x-4} + 2 = f(x) = (\sqrt{x-4} + 2)^2 \quad (1)$$

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

$$f(x) + g(x) = |\sqrt{x-4} + 2| + |\sqrt{x-4} - 2| = \sqrt{x-4} + 2 + \sqrt{x-4} - 2 = 2\sqrt{x-4} \quad (3)$$

$$x \geq 4$$

$$\begin{matrix} a=0 \\ b=2 \\ c=-4 \end{matrix}$$

$$\frac{a+b}{c} = \frac{0+2}{-4} = -\frac{1}{2}$$

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

بیمه های تابع f (3) و (1) است پس
در این نقاط تغییر می کند

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

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

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

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

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

$$f(2x) = 2x+2 \Rightarrow \boxed{x=1} \rightarrow f(2x) = \left\{ \left(\frac{1}{2}, 2\right), \left(\frac{3}{2}, 1\right), \left(\frac{5}{2}, 2\right), \left(-\frac{1}{2}, 4\right) \right\}$$

$$f(x^2) = x^2+2 \Rightarrow x^2=1 \Rightarrow x=\pm 1 \rightarrow f(x^2) = \left\{ (1, 2), (-1, 2), (\sqrt{3}, 1), (-\sqrt{3}, 1), (2, 2), (-2, 2) \right\}$$

$$2g^2(x)+1 \Rightarrow g^2(x) = \left\{ (-2, 4), (1, 1), (3, 4), (-1, 0) \right\} \Rightarrow 2g^2(x) = \left\{ (-4, 8), (2, 2), (6, 8), (-2, 0) \right\}$$

$$2g^2(x)+1 \Rightarrow \left\{ (-2, 1), (3, 9), (1, 1), (-1, 1) \right\}$$

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

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

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

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

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

$$h = f + g \Rightarrow \{(2,5)(3,5)(4,5)\}$$

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

$$g(n) = [n] + [n]$$

(II)

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

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

(I)

$$\textcircled{1} \quad 2n \in \mathbb{Z}$$

$$\textcircled{2} \quad \sqrt{n} - n \in \mathbb{Z} \Rightarrow \sqrt{n} \in \mathbb{Z} \Rightarrow n = k^2 \Rightarrow \frac{1}{1-k^2} \Rightarrow \{0, 1\}$$

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

$$\textcircled{3} \quad n \neq 1$$

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

دامین تابع f

$$f(n) = \sqrt{\omega n - n^2 - 4} \quad g(n) = \{(1,2)(2,2)(3,4)(0,1)\}$$

$$\sqrt{-(n^2 - \omega n + 4)} \Rightarrow \sqrt{-(n-1)(n-4)} \quad \frac{1}{-\phi + \phi -} \Rightarrow \cancel{D = \{1, 4\}}$$

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

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

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

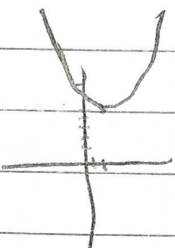
$$x = \sqrt{\frac{1+y}{y}} + 1 \rightarrow y \neq 0$$

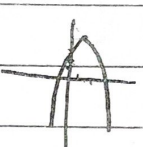
$$\frac{1+y}{y} \geq 0 \Rightarrow \frac{1}{y} \geq -1 \Rightarrow R_f = \mathbb{R} - (-1, 0]$$



Senobar

(7)

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

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

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

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

(9)

الف) $R_f \in \mathbb{R}$ 

ب) $R_f \in \mathbb{R}$ 

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

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

(10)

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

$R_f = \mathbb{R} - \{2\}$  

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