

|                                                                                                                                                                                                                                                                                                                                                             |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| $f(n) = \sqrt{(\sqrt{n-4}+2)^2}$ $g(n) = \sqrt{(\sqrt{n-4}-2)^2}$<br>$f(n) + g(n) = a + b\sqrt{n+c} \rightarrow  \sqrt{n-4}+2  +  \sqrt{n-4}-2 $<br>$\sqrt{n-4} + 2 + \sqrt{n-4} - 2 \rightarrow 2\sqrt{n-4} = a + b\sqrt{n+c}$<br>$\frac{a+b}{c} = \frac{2}{-4} = -\frac{1}{2}$ $a=0, b=2, c=-4$                                                           | ۱ |
| $f(n) = \{(2, -4), (0, \frac{2}{3})\}$<br>$\frac{g}{f} = \{(2, -\frac{1}{4}), (0, \frac{2}{3})\}$                                                                                                                                                                                                                                                           | ۲ |
| $f(n) = \{(\frac{1}{2}, 2), (\frac{3}{2}, -1), (2, 2), (-\frac{1}{2}, 2)\}$<br>$f(n) = \{(\pm 1, 2), (\pm 3, -1), (\pm 2, 2)\}$<br>$2g(n) + 1 = \{(-2, 1), (1, 3), (3, 9), (-1, 1)\}$<br>$\frac{2f}{g} = \{(1, -4), (3, -1)\}$                                                                                                                              | ۳ |
| $2f = \{(2, 2), (4, 2), (6, 9), (-2, 0)\}$<br>$h = \{(2, 0), (4, 0), (-2, 2)\}$                                                                                                                                                                                                                                                                             | ۴ |
| $\frac{f}{g+1} \rightarrow g \neq -1 \rightarrow n \in \mathbb{Z}$ if $n \in \mathbb{Z}$ $g(n)=0$ if $n \notin \mathbb{Z}$ $g(n)=-1$<br>$3n \geq 0 \rightarrow n \geq 0, n \neq 2$<br>$\sqrt{3n-n} \geq 0 \rightarrow \sqrt{3n} \geq n \rightarrow 3n \geq n^2 \rightarrow n^2 - 3n \leq 0$<br>$n(n-3) \leq 0 \rightarrow \frac{n}{n-3} \rightarrow [0, 3]$ | ۵ |

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| $f(m) = \{(1,0), (2, \sqrt{2}), (4,0)\}$<br>$h(m) = \frac{f(m)}{g(m)} = \{(1,0), (2, \sqrt{2}), (4,0)\}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ٦    |
| <p>الف <math>= \mathbb{R} \rightarrow</math> توان سوم داریم <math>\rightarrow (m-1)^3 + 1 = y \quad y-1 = (m-1)^3</math><br/> <math>m-1 = \sqrt[3]{y-1} \rightarrow m = 1 + \sqrt[3]{y-1} \quad R_f = \mathbb{R}</math></p> <p>ب <math>y=0 \rightarrow 1=0 \times</math> حقیقت ندارد<br/> <math>y m^3 - 2 y m = 1 \rightarrow y m^3 - 2 y m - 1 = 0 \rightarrow m = 2y \pm \sqrt{4y^2 - 4y}</math><br/> <math>4y^2 - 4y \geq 0 \rightarrow y^2 + y \geq 0 \rightarrow y(y+1) \geq 0 \quad \frac{-1 \pm 0}{2 \pm 1}</math><br/> <math>R_f = (-\infty, -1] \cup (0, +\infty)</math> با فرض <math>y \neq 0</math> عبارت را درجه ۲ فرض کنیم!</p> | ٧، ٨ |
| <p>الف <math>\rightarrow \min \rightarrow m = \frac{4}{y} = 2, y = 4 \quad R_f = [4, +\infty)</math><br/>         ب <math>\rightarrow \max \rightarrow m = \frac{-4}{-2} = 2, y = 12 \quad R_f = (-\infty, 12]</math><br/>         ج <math>\rightarrow \min \rightarrow m = \frac{4}{y} = 2 \rightarrow y = -4 \quad [-4, +\infty) \rightarrow [0, +\infty)</math><br/>         د <math>\rightarrow \max \rightarrow \frac{-4}{-2} = 2, y = 9 \quad (-\infty, 9] \rightarrow [0, 3]</math></p>                                                                                                                                               | ٨    |
| <p>الف <math>= \mathbb{R}</math><br/>         ب <math>= \mathbb{R}</math><br/>         ج <math>\mathbb{R} \xrightarrow{\sqrt{\cdot}} [0, +\infty)</math><br/>         د <math>\rightarrow \mathbb{R} \xrightarrow{\text{کون}} [0, +\infty)</math></p>                                                                                                                                                                                                                                                                                                                                                                                        | ٩    |
| <p>الف <math>\mathbb{R} \rightarrow \{3\}</math><br/>         ب <math>\mathbb{R} \rightarrow \{2\}</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ١٠   |

$$f_{(2n)} = \left\{ \left( \frac{1}{2}, 2 \right) \left( \frac{3}{2}, -1 \right) (2, 2) \left( -\frac{1}{2}, 4 \right) \right\} \quad \text{ن های } f \text{ باید حتم بر ۲ بیوند!} \quad (3)$$

$$f_{(2)} = \left\{ (1, 2) (-1, 2) (\sqrt{3}, -1) (-\sqrt{3}, -1) (2, 2) (-2, 2) \right\} \quad \text{هر کدام از ن های } f \text{ را برابر } n^2 \text{ قرار دهیم!}$$

$$f_{g'(n)+1} = \left\{ (-2, 19) (1, 3) (3, 9) (-1, 1) \right\} \quad \text{این عمل روی و های اعمال می شود:}$$

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

$$\text{الف) } y = n^3 - 2n^2 + 2n - 1 + 1 = y = (n-1)^3 + 1 \quad (4)$$

$$y - 1 = (n-1)^3 \rightarrow \sqrt[3]{y-1} = n-1 \rightarrow n = \sqrt[3]{y-1} + 1$$

$$R_f = \mathbb{R}$$

$$\text{ب) } y = \frac{1}{n^2 - 2n} \rightarrow n^2 y - 2n y = 1 \rightarrow n^2 y - 2n y - 1 = 0$$

$$\underline{y \neq 0} \rightarrow n = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y} \rightarrow 4y(y+1) \geq 0 \rightarrow \frac{-1}{+} \frac{0}{+}$$

$$\underline{y = 0} \rightarrow 0 = 1 \times \text{صحتی وجود ندارد!} \rightarrow R_f = (-\infty, -1] \cup (0, +\infty)$$