

$$f(x) = \begin{cases} x^3 - 4 & x > a \\ 11x - 2 & x \leq a \end{cases} \quad \mathbb{R} \rightarrow (a^3 - 4, +\infty) \cup (-\infty, 11a - 2]$$

$$a^3 - 4 - 11a + 2 = 0 \Rightarrow a^3 - 11a + 14 = 0 \quad \text{if } a = 2 \Rightarrow \text{میان صفر شود}$$

$$\frac{a^3 - 11a + 14}{-a^3 + 11a - 14} \cdot \frac{a-2}{a+2} = \frac{(a-2)^2(a+4)}{(a+2)(a-2)}$$

$$(a-2)^2(a+4)$$

$$\frac{-4}{-1} + \frac{2}{1} + \frac{2}{1} = 2$$

$$\Rightarrow a \in [-4, +\infty)$$

$$\frac{11a^2 - 11a + 14}{-11a^2 + 11a - 14}$$

$$f(x) = 11x + k, \quad f^{-1}(2) = 4$$

$$2 \rightarrow 4 \Rightarrow \text{مربوط به } 4 \rightarrow 2$$

$$\text{if } x = 4 \Rightarrow 11k = 2 \Rightarrow k = -1$$

$$\text{الف) } f(v) \rightarrow f(x) = 11x - 1 \Rightarrow \text{if } x = v$$

$$f(x) = 11v - 1 \quad \text{ب) } f(f(x)) \rightarrow f(11x - 1) = 11(11x - 1) - 1 = 121x - 12$$

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

$$a \mid \frac{1}{a} \rightarrow \frac{1}{a}$$

$$f(x) = \frac{ax}{x-1} \xrightarrow{\text{if } x=a} \frac{a^2}{a-1} = \frac{1}{a} \Rightarrow a^2 = \frac{1}{a-1} \Rightarrow a^2(a-1) = 1 \Rightarrow a^3 - a^2 - 1 = 0$$

$$a = 1 \rightarrow \frac{1}{0} \text{ (undefined)}$$

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

$$\text{الف) } f \circ f^{-1} \rightarrow f^{-1} \rightarrow (5,3), (2,4), (1,2), (4,1) \rightarrow f \circ f^{-1} \rightarrow \{(5,5), (2,2), (1,1), (4,4)\}$$

$$\text{ب) } f^{-1} \circ f \rightarrow \{(3,3), (4,4), (2,2), (1,1)\}$$

$$\text{ج) } f \circ g^{-1} \rightarrow g^{-1} \rightarrow (2,3), (4,1), (5,4) \rightarrow f \circ g^{-1} \rightarrow \{(2,5), (4,4)\}$$

$$\text{د) } g^{-1} \circ f \rightarrow \{(3,4), (1,3), (4,1)\}$$

$$f = \{(2,4), (4,1), (1,5)\} \quad g = \{(2,1), (4,3), (1,5)\} \quad h = \{(1,2), (3,4), (4,1), (5,1)\}$$

$$\frac{h}{f \circ g^{-1}} \rightarrow g^{-1} \rightarrow (4,2), (1,4), (5,1)$$

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$y = \frac{x+1}{x-2}$ فرض کنیم $\rightarrow$ دایره بیضی (دایره) $y = \frac{x+1}{x-2} \rightarrow y(x-2) = x+1$
 $yx - 2y = x + 1$
 $yx - x = -2y + 1$
 $x(y-1) = -2y + 1$
 $x = \frac{-2y + 1}{y-1}$

if $x \rightarrow 2$
 if $x \rightarrow 1$
 if $x \rightarrow \frac{1}{-2}$

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$f(x) = |x-1| - |x-2|$ [a, b] \rightarrow دایره بیضی (دایره) $f(x) = |x-1| - |x-2|$

if $x=1 \rightarrow -1$
 if $x=2 \rightarrow 1$

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$f(x) = \begin{cases} x^2 + 1 & ; x \geq 1 \\ x-1 & ; x < 0 \end{cases}$ if $x=1 \rightarrow y=2$ if $x=0 \rightarrow y=-1$

$f^{-1}(x) = \begin{cases} y = \sqrt{x-1} & ; x \geq 1 \\ y = \frac{x+1}{2} & ; x < 1 \end{cases}$

$y = x^2 + 1 \rightarrow y-1 = x^2 \rightarrow x = \sqrt{y-1} \rightarrow y = \sqrt{x-1}$

$y = x-1 \rightarrow y+1 = x \rightarrow x = \frac{y+1}{1} \rightarrow y = \frac{x+1}{2}$

$f(x) = x^2 - \frac{(x+1)^2}{x+2}$ f^{-1}(x) = \frac{ax+b}{cx+d} f^{-1}(b) = ?

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$f(x) = \frac{x}{x^2+1}$ if $x=1 \rightarrow y=1/2$ if $x=-1 \rightarrow y=-1/2$

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