

$$a^2 - 4 \geq 12a - 20$$

$$a^2 - 12a + 17 \geq 0$$

$$\frac{a^2 - 12a + 17}{-a^2 + 12a - 17} \cdot \frac{a-2}{a^2 + 2a - 8}$$

$$\frac{2a^2 - 12a + 17}{-2a^2 + 4a}$$

$$\frac{-12a + 17}{+12a - 17}$$

$$(a-2)(a+4)(a-2) \geq 0$$

$$\frac{-4}{-4+4+4}$$

$$a \geq -4$$

(2)

14

$$f(4) = 2$$

$$12 + k = 2$$

$$k = -10$$

$$f(7) = 21 - 10 = 11$$

$$f(f(x)) = f(3x - 10) = 9x - 30 - 10 = 9x - 40$$

(2)

$$f(a) = 2a$$

$$\frac{a^2}{a-1} = 2a$$

$$a^2 = 2a^2 - 2a$$

$$a(a-2) = 0$$

$$a=0 \quad a=2$$

(1, 75)

$a=0$ نمی تواند باشد زیرا در این صورت $f(a)=0$ می شود و وارون پیدا نخواهد بود

$$f \circ f^{-1} = \{(5, 5), (7, 7), (2, 2), (4, 4)\}$$

$$f^{-1} \circ f = \{(5, 5), (4, 4), (7, 7), (2, 2)\}$$

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

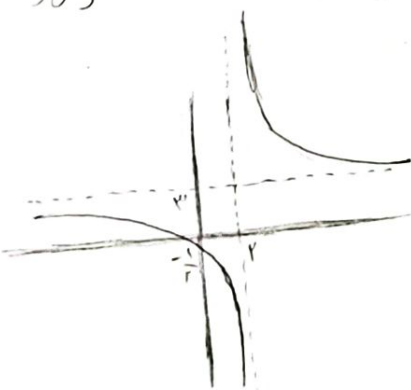
$$g^{-1} \circ f = \{(3, 9), (7, 3), (9, 8)\}$$

(1, 75)

$$\frac{h}{f \circ g^{-1}} = \{(1, \frac{1}{4}), (3, \frac{1}{4})\}$$

$$\frac{h}{f \circ g^{-1}}(1) = \frac{1}{4} = \frac{1}{4} \quad \frac{h}{f \circ g^{-1}}(3) = \frac{1}{4} = \frac{1}{4}$$

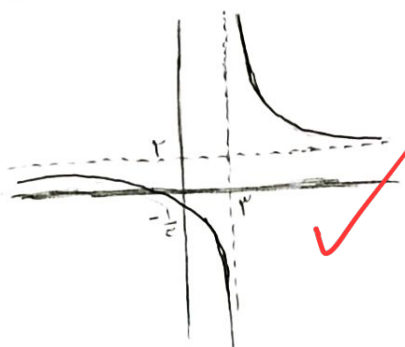
(2)



تکثیر است

معکوس

$$\frac{3y+1}{y-2} = x \quad y = \frac{-3x-1}{x-3} = \frac{3x+1}{x-3}$$



(2)

[1,3]

$[a,b]$ تابع $f(x) = 2x - 4$ معکوس $x = 2y - 4$

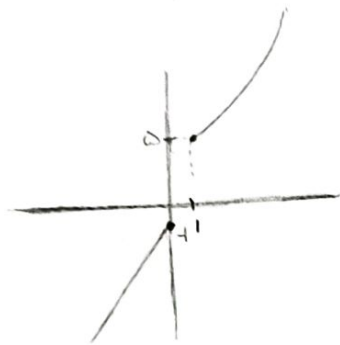
$n = \frac{2+2}{2-1} = 2$

$\checkmark y = \frac{x+4}{2}$

$-2 \leq x \leq 2$



1,75



یک به یک است

$y = x^2 + 4$ معکوس $x = \sqrt{y-4}$
 $y = \sqrt{x-4}$

$y = 4x - 1$ معکوس $x = \frac{y+1}{4}$
 $y = \frac{x+1}{4}$

2

$f^{-1}(x) = \begin{cases} \sqrt[3]{x-4} & ; x \geq 4 \\ \frac{x+1}{4} & ; x \leq -1 \end{cases}$

$f(x) = x^2 - \frac{(x+1)^3}{x+3} = \frac{x^3 + 3x^2 - x^3 - 3x^2 - 3x - 1}{x+3} = \frac{-3x-1}{x+3}$

معکوس $\rightarrow \frac{-3y-1}{y+3} = x$
 $y = -\frac{3x+1}{x+3} = \frac{-4x-2}{2x+7}$
 $f^{-1}(-2) = 0$ $\checkmark$

2

$y = \frac{x}{x^2+1}$

$x^2y + y = x$

$x^2y - x + y = 0$

$x = \frac{1 \pm \sqrt{1-4y^2}}{2y}$

معکوس $y = \frac{1 \pm \sqrt{1-4x^2}}{2x}$

$|x| < \frac{1}{2}$

1,75

چون x و y هم علامتند پس فقط $+$ مانده مقبول است