

سوال ۱:

$$f(x) = \begin{cases} x^2 - c & ; x > a \\ 12n \cdot x_0 & ; x \leq a \end{cases} \quad \begin{cases} 12n - 20 \leq a^3 - c \\ 12a - 20 \leq a^3 - c \end{cases} \quad a = n$$



$$(a^3 - 12a + 14)(a - 2) \leq 0$$

$$a^3 - 12a + 14 \geq 0$$

$$\frac{a^3 - 12a + 14}{a^3 - 2a} \cdot \frac{a - 2}{a + 2a - 1}$$

$$D_f = R_{f-1}$$

$$D_{f-1} = R_f$$

$$D_{f-1} = R_f - 12a + 14$$

الف) $f(v)$

$$f(x) = 3n + k$$

$$f(2) = c$$

سوال ۲:

$$f(v) = 3 \times v - 10 = 11$$

$$f(c) = 2 \Rightarrow 3c + k = 2 \Rightarrow k = -10$$

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

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

$$f^{-1}(2a) = a$$

$$Df^{-1} = Rf$$

سوال ۳:

$$Df = Rf^{-1}$$

$$f(a) = 2a$$

$$f(a) = \frac{a^2}{a-1} = 2a \Rightarrow 2a^2 - 2a = a^2$$

$$a^2 - 2a = 0 \Rightarrow a(a-2) = 0$$

$$f = \{(3, \omega), (5, \nu), (7, \rho), (9, \theta)\} \quad f^{-1} = \{(\omega, 3), (\nu, 5), (\rho, 7), (\theta, 9)\}$$

$$g = \{(2, \rho), (1, \theta), (9, \omega)\} \quad g^{-1} = \{(\rho, 2), (\theta, 1), (\omega, 9)\}$$

$$f \circ f^{-1} \quad f(f^{-1}) = \{(\omega, \omega), (\nu, \nu), (\rho, \rho), (\theta, \theta)\}$$

$$f^{-1} \circ f \quad f^{-1}(f) = \{(3, 3), (5, 5), (7, 7), (9, 9)\}$$

$$g \circ g^{-1} \quad g(g^{-1}) = \{(2, 2), (\theta, \theta)\}$$

$$g^{-1} \circ g \quad g^{-1}(g) = \{(2, 2), (\nu, 3), (9, 1)\}$$

$f = \{(2, 4), (4, 1), (6, 0)\}$ $g = \{(2, 1), (4, 3), (6, 5)\}$: سوال 5

$h = \{(1, 2), (3, 4), (5, 1), (7, 1)\}$ $\frac{h}{f \circ g^{-1}} = ?$ $g^{-1} = \{(1, 2), (3, 4), (5, 6)\}$

$f(g^{-1}) = \{(1, 4), (3, 1), (5, 0)\}$

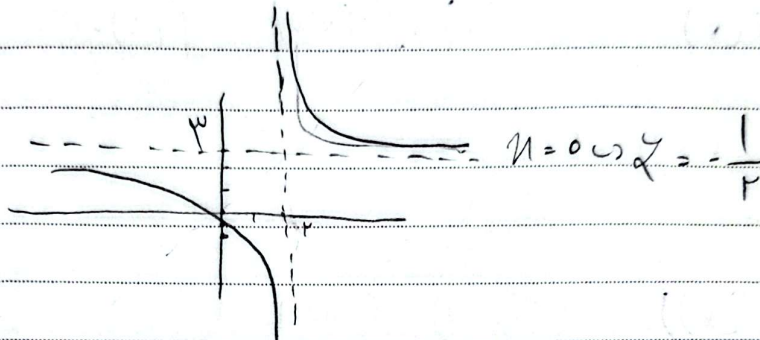
$f(g^{-1}) = \{(1, 4), (3, 1), (5, 0)\}$

$\frac{h}{f \circ g^{-1}} = \{(1, \frac{2}{4}), (3, \frac{4}{1}), (5, \frac{1}{0})\}$

$g = \frac{3n+1}{n-2}$

مقادیر $n = 1$

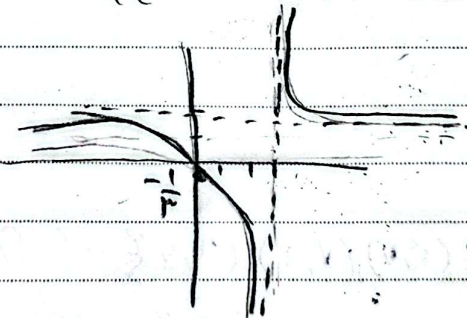
مقادیر $n = 3$



$g = \frac{3n+1}{n-2} \rightarrow n = \frac{3g+1}{g-2} \rightarrow ng - 2n = 3g+1$

$ng + 3g = 1 + 2n$

$g(n-2) = 1+2n \rightarrow g = \frac{1+2n}{n-2}$



مقادیر $n = 1$

مقادیر $n = 3$

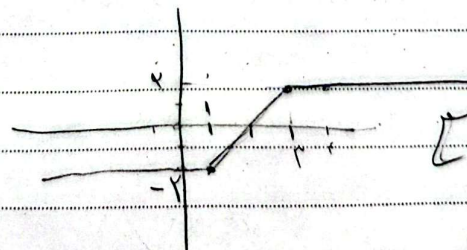
$g = -\frac{1}{3} \rightarrow n = 0$

$f(x) = \begin{cases} |x-1| & x \leq 1 \\ |x-3| & x > 1 \end{cases}$

$-n+1+n-3 = -2 \quad n \leq 1$

$n-1+n-3 = 2n-4 \quad 1 < n \leq 3$

$x-1+x-3 = 2 \quad n > 3$



$1 < n \leq 3 \rightarrow x-1+x-3 = 2x-4$

$2x-4 = 2 \rightarrow x = 3 \rightarrow n = 3 \rightarrow g = \frac{1+2n}{n-2}$

Arman

$$f(x) = \begin{cases} n^2 + 1 & ; n \geq 1 \rightarrow 1, 2, 3, \dots \\ n-1 & ; n \leq 0, 0, -1, -2, \dots \end{cases}$$

سوال ۸:

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

$$n-1 = y \rightarrow y = \sqrt{n-1}$$



$$R_{f(x)} = D_{f(x)}$$

$$y = (n-1) \rightarrow n = (y+1) \rightarrow \frac{n+1}{2} = y$$

$$[0, +\infty) \cup (-\infty, -1]$$

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

سوال ۹:

$$f(x) = \frac{n^2(n+1)}{n+3} \quad f^{-1}(x) = \frac{ax+b}{cn+d}$$

$$n^2(n+3) \rightarrow n^3 + 3n^2 \rightarrow n^3 - 3n - 1 \rightarrow \frac{-(3n+1)}{n+3} = y$$

$$f(y) = \frac{-(3n+1)}{n+3} \rightarrow f^{-1}(x) = \frac{-(3x+1)}{x+3} \rightarrow n \cdot \frac{y+3}{x+3} = -\frac{3x+1}{x+3}$$

$$(3n+1)x = -3n-1$$

$$a = -4, d = 4, b = -4, c = 4 \rightarrow f^{-1}(x) = \frac{-4x-4}{4x+4} \rightarrow x = \frac{-(3n+1)}{3+n}$$

$$f^{-1}(-1) = \frac{-4(-1)-4}{4(-1)+4} = \frac{0}{0} = 0$$

سوال ۱۰:

$$f(x) = \frac{n}{n^2+1} \rightarrow y = \frac{n}{n^2+1} \rightarrow n = \frac{y}{y^2+1} \rightarrow n \cdot \frac{y^2+1}{y} = y$$

$$1 - n^2 \geq 0 \rightarrow 1 \geq n^2 \rightarrow n^2 \leq 1 \rightarrow -1 \leq n \leq 1$$

$$\frac{1}{y} \geq n^2 \rightarrow -\frac{1}{y} \leq n \leq \frac{1}{y} \rightarrow n \neq 0$$

$$\sim \rightarrow f^{-1}(x) = \begin{cases} \frac{1+\sqrt{1-4x^2}}{2x} & ; 0 < x \leq \frac{1}{2} \\ \frac{1-\sqrt{1-4x^2}}{2x} & ; -\frac{1}{2} \leq x < 0 \end{cases}$$