

برای ارضای ضمیمه برش داشته باشند
 $x^2 + (-\varepsilon) = f(n) \rightarrow R = (a^3 - \varepsilon, +\infty), 12n - 20 = f(n) \rightarrow R = (-\infty, 12a - 20]$

$12a - 20 \leq a^3 - \varepsilon \rightarrow a^3 - 12 + 14 \gg 0 \rightarrow (a-2)^2(a+4) \gg 0 \rightarrow$

$\begin{array}{c} -\varepsilon \quad 2^* \\ - \quad + \quad + \\ \hline \end{array}$

$\leftarrow a \gg -\varepsilon$

۵

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

$f^{-1}(2) = \varepsilon \rightarrow \frac{2-k}{3} = \varepsilon \rightarrow 2-k = 12 \rightarrow k = -10$

$f(v) = 3(v) - 10 = 21 - 10 = 11$ $\hookrightarrow f(f(n)) = 3(3n - 10) - 10 = 9n - 40$

$f(n) = \frac{an}{n-1} \rightarrow y = \frac{an}{n-1} \rightarrow yn - y = an \rightarrow (y-a)n = y \rightarrow n = \frac{y}{y-a} \rightarrow f^{-1}(n) = \frac{n}{n-a}$

$\rightarrow A(2a, a) \rightarrow \frac{2a}{2a-a} = a \rightarrow \frac{2a}{a} = 2 \rightarrow \boxed{a=2}$

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

ب) $f^{-1} \circ f = \{(2, 3)(\varepsilon, \varepsilon)(v, v)(9, 9)\}$

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

د) $g^{-1} \circ f = \{(2, 9)(v, 3)(9, 1)\}$

$g^{-1} = \{(1, 2)(2, \varepsilon)(5, 4)\} \rightarrow f \circ g^{-1} = \{(1, \varepsilon)(2, 1)(5, 0)\}$

$\frac{h}{f \circ g^{-1}} = \frac{2}{\varepsilon} = \frac{1}{2}, \quad \frac{h}{f \circ g^{-1}} = \frac{4}{1} = \frac{1}{4}, \quad \frac{h}{f \circ g^{-1}} = \frac{1}{0} \rightarrow \text{معتد} \rightarrow \frac{h}{f \circ g^{-1}} = \left\{1, \frac{1}{2}, \frac{1}{4}, \frac{1}{0}\right\}$

۵

$y = \frac{r_{n+1}}{n-r} \rightarrow \begin{cases} \text{من جانب } r \rightarrow \frac{r}{c} = n \rightarrow n=r \\ \text{من جانب } \infty \rightarrow \frac{a}{c} = y \rightarrow y=r \end{cases}$

$y = \frac{r_{n+1}}{n-r} \rightarrow \begin{cases} y = \frac{a}{c} = r \\ n = \frac{a}{y-r} = 3 \end{cases}$

$x \rightarrow y = -\frac{1}{r}$

$y = \frac{r_{n+1}}{n-r} \rightarrow y_{n+1} \cdot y = r_{n+1} \rightarrow f^{-1}(n) = \frac{r_{n+1}}{n-r}$

$n=0 \rightarrow y = -\frac{1}{r}$

5

$y = |n-1| - |n-3| \rightarrow \begin{cases} -r \\ r \\ -r \\ r \end{cases}$

$\rightarrow [a, b] \rightarrow [1, 3] \rightarrow a=1, b=3 \rightarrow y = r_{n \pm \varepsilon}, n \in [1, 3]$

$y = r_{n \pm \varepsilon} \rightarrow y^{-1} = \frac{n \pm \varepsilon}{r} \rightarrow R_y = D_{y^{-1}} = [-r, r]$

5

$x+r = y \rightarrow R = [\Delta, +\infty), r_{n-1} = y \rightarrow R = (-\infty, -1]$

$y = n^r + \varepsilon \rightarrow n^r = y - \varepsilon \rightarrow n = \sqrt[r]{y - \varepsilon}$

$y = r_{n-1} \rightarrow r_n = y+1 \rightarrow n = \frac{y+1}{r} \rightarrow y = \frac{n+1}{\varepsilon}$

$f^{-1}(n) = \begin{cases} \sqrt[r]{n - \varepsilon} \rightarrow R_y = D_{y^{-1}} = [\Delta, +\infty) = n > \Delta \\ \frac{n+1}{\varepsilon} \rightarrow R_y = D_{y^{-1}} = (-\infty, -1], n \leq -1 \end{cases}$

5

$f(n) = n^r - \frac{(n+1)^r}{n+r} \rightarrow f(n) = \frac{n^r + r n^r - n^r - 1 - r n^r - r n}{n+r} = \frac{-r n - 1}{n+r}$

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

$\frac{-r n - 1}{n+r} = \frac{a n + b}{r n + d} \rightarrow a = -r, b = -1, d = r \rightarrow f^{-1}(b) = f^{-1}(-1) = \frac{-r(-1) - 1}{-r+r} = \Delta$

5

$y = \frac{n}{n^r + 1} \rightarrow y(n^r + 1) = n \rightarrow y n^r + y - n = 0 \rightarrow n = \frac{-b \pm \sqrt{\Delta}}{r a} \rightarrow b = -1, c = y, a = y$

$x = \frac{1 \pm \sqrt{1 - 4 y^r}}{r y}, y \neq 0$

$f^{-1}(n) = \begin{cases} \frac{1 + \sqrt{1 - 4 n^r}}{r n} \\ \frac{1 - \sqrt{1 - 4 n^r}}{r n} \end{cases}$

$1 - 4 n^r > 0 \rightarrow n^r < \frac{1}{4} \rightarrow x < \frac{1}{r}$

$x \in [-\frac{1}{r}, \frac{1}{r}], x \neq 0$

5