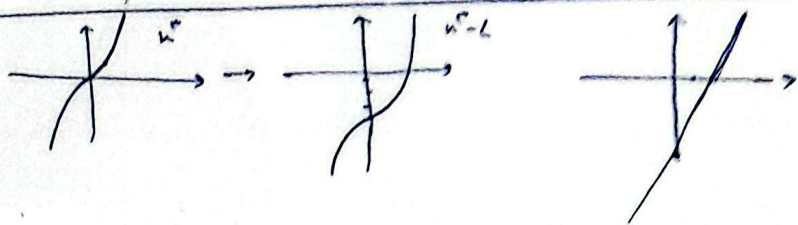


$$f(u) = \begin{cases} u^2 - 4 & ; u > a \\ 14u - 4 & ; u \leq a \end{cases}$$



$$a^2 - 4 > 14a - 4$$

$$a^2 - 14a + 4 > 0$$

$$(a-2)(a^2+2a-1) > 0$$

$$(a-2)(a+1)(a-2) > 0$$

$$\frac{-2 \pm \sqrt{17}}{-1 \pm 1} \quad (-2, 2) \cup (2, +\infty)$$

$$f(u) = 3u + k \quad f^{-1}(r) = r \Rightarrow f(r) = r$$

$$1r + k = r \Rightarrow k = -10 \Rightarrow f(u) = 3u - 10$$

$$\text{اذا } f(v) = r - 10 = 11$$

$$\text{ب) } f(f(u)) = 3(3u - 10) - 10 = 9u - 40 = 11$$

$$f(u) = \frac{au}{u-1} \Rightarrow u = \frac{ay}{y-1} \Rightarrow uy - u \leq ay \Rightarrow y(a-u) = -u \Rightarrow y = \frac{u}{u-a}$$

$$a = \frac{ya}{ya-a} \Rightarrow \boxed{a = 2}$$

$$f = \{(1,0), (2,1), (3,2), (4,3)\}$$

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

$$\text{اذا } f \circ f^{-1} = \{(0,0), (1,1), (2,2), (3,3)\}$$

$$f^{-1} = \{(0,1), (1,2), (2,3), (3,4)\}$$

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

$$\text{ج) } f \circ g^{-1} = \{(0,1), (1,2)\}$$

$$g^{-1} = \{(1,1), (2,2), (3,3), (4,4)\}$$

$$\text{د) } g^{-1} \circ f = \{(1,1), (2,2), (3,3), (4,4)\}$$

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

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

$$h = \{(1,1), (2,2), (3,3), (4,4)\}$$

$$g^{-1} = \{(1,1), (2,2), (3,3), (4,4)\}$$

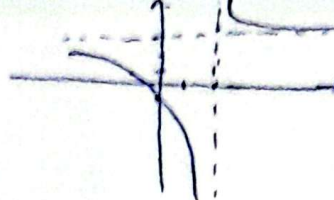
$$\frac{h}{f \circ g^{-1}} = \{(1, \frac{1}{f}), (2, \frac{2}{f}), (3, \frac{3}{f}), (4, \frac{4}{f})\} = \{(1, \frac{1}{f}), (2, \frac{2}{f})\}$$

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

$$y = \frac{ru+1}{u-r}$$

$$ru+1 = r$$

$$ru = r-1$$



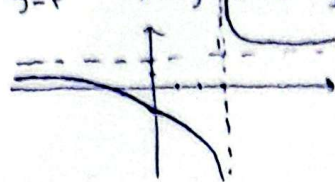
-4

$$\lim_{u \rightarrow r} \frac{1}{u-r}$$

$$y = \frac{ru+1}{u-r} \Rightarrow uy - ru = ru+1 \Rightarrow y(u-r) = ru+1 \Rightarrow y = \frac{ru+1}{u-r}$$

$$ru = r$$

$$ru = r$$

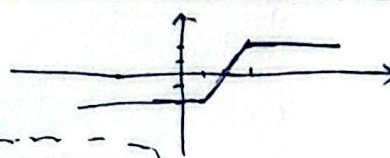


$$\lim_{u \rightarrow r} y = \frac{1}{r}$$

$$f(u) = |u-1| - |u-r|$$

$$[1, r] \rightarrow ru - r$$

$$u = ry - 2 \Rightarrow ry \leq u + 2 \Rightarrow y \leq \frac{u}{r} + 2$$

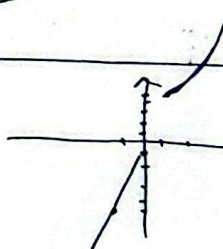


-v

$$f(u) = \begin{cases} u^r + 2 & ; u \geq 1 \\ ru - 1 & ; u \leq 0 \end{cases}$$

$$y^r = u - 2 \Rightarrow y = \sqrt[r]{u-2}$$

$$ry \leq u + 1 \Rightarrow y \leq \frac{u+1}{r}$$



$$f^{-1}(u) = \begin{cases} \sqrt[r]{u-r} & u \geq 0 \\ \frac{u+1}{r} & u \leq -1 \end{cases}$$

-1

$$f(u) = u^r - \frac{u^r+1+ru^r+ru}{u+r} = \frac{u^r+ru^r - u^r-1-ru^r-ru}{u+r} = \frac{-ru-1}{u+r}$$

-7

$$u = \frac{-ry-1}{y+r} \Rightarrow ry + ru = -ry-1 \Rightarrow y(u+r) = -ru-1 \Rightarrow y = \left(\frac{-ru-1}{u+r} \right) \times \frac{1}{r} \times r = \frac{-ru-1}{ru+4}$$

$$b = -r$$

$$f^{-1}(-r) = \frac{4-1}{1} = 3$$

$$f(u) = \frac{u}{u^r+1}$$

$$u = \frac{y}{y^r+1} \Rightarrow uy^r + u = y$$

$$uy^r - y + u = 0$$

$$\Rightarrow y = \frac{1 \pm \sqrt{1-ru^r}}{ru}$$

-6