

$$الف) \quad f\left(\frac{x}{p} - \left[\frac{x}{p}\right]\right)^p$$

$$\rightarrow 0 \leq \frac{x}{p} - \left[\frac{x}{p}\right] < 1 \rightarrow 0 \leq \left(\frac{x}{p} - \left[\frac{x}{p}\right]\right)^p < 1$$

$$\text{می دانیم } 0 \leq \left(\frac{x}{p} - \left[\frac{x}{p}\right]\right)^p < 1$$

$$\Rightarrow 0 \leq f\left(\frac{x}{p} - \left[\frac{x}{p}\right]\right)^p < 1$$

$$ب) \quad -\sin x + \log y - k = 0 \rightarrow \log y = \sin x + k \rightarrow y = 10^{\sin x + k} \quad \begin{matrix} -1 \leq \sin x \leq 1 \\ \mu \leq \sin x + k \leq \omega \end{matrix}$$

$$\rightarrow y = 10^{\mu} < 10^{\sin x + k} \leq 10^{\omega}$$

$[0, +\infty)$

$$\frac{x^p - k}{x^p - 9} \xrightarrow{+\infty} y = 1 \quad \rightarrow x^p - 9 = 0 \quad \rightarrow x = [-\infty, \frac{9}{p}] \cup [1, +\infty) \quad -p$$

$$\xrightarrow{0} y = \frac{k}{9}$$

$$y \geq 0 \rightarrow [0, \frac{k}{9}] \cup [1, +\infty)$$

$$1 + 0 + \frac{k}{9} = \frac{1+k}{9}$$

$$f(x) = \left(\sqrt{x + \frac{1}{x}} + 1\right)^p - 1$$

$$x > 0 \rightarrow x + \frac{1}{x} \geq p \rightarrow \sqrt{x + \frac{1}{x}} \geq \sqrt{p} \rightarrow \sqrt{x + \frac{1}{x}} + 1 \geq \sqrt{p} + 1$$

$$\rightarrow \left(\sqrt{x + \frac{1}{x}} + 1\right)^p \geq p + p\sqrt{p} \rightarrow \left(\sqrt{x + \frac{1}{x}} + 1\right)^p - 1 \geq p + p\sqrt{p}$$

$$ب) \quad \mu + \mu \sin x - \sin x - \sin x^p = -\sin^p x + p \sin x + \mu$$

$$-1 \leq \sin x \leq 1 \rightarrow \begin{matrix} \sin x = -1 \rightarrow -(1) - p + \mu = 0 \\ \sin x = 1 \rightarrow -(1) + p + \mu = k \end{matrix} \quad \frac{-b}{pa} = \frac{-p}{-p} = 1 \rightarrow -1 + p + \mu = k$$

$$\rightarrow 0 \leq R \leq k$$

$$Df = \{1, 3, 5, \dots, 9\} \quad x=1 \rightarrow y = -\frac{1}{p} + 10 = \frac{p-1}{p} \quad x=p \rightarrow y = -\frac{p}{p} + 10 = \frac{p-1}{p}$$

$$x=p \rightarrow y=9 \quad x=k \rightarrow y = \frac{p-4}{p} \quad x=\omega \rightarrow y = \frac{p-\omega}{p} \quad x=k \rightarrow y = \frac{p-4}{p}$$

$$x=p \rightarrow y=9 \quad x=p \rightarrow y = \frac{p-1}{p} \quad x=1 \rightarrow y = \frac{p-1}{p}$$

$$\frac{p-1}{p} + \frac{p-1}{p} + \frac{p-1}{p} + \frac{p-4}{p} + \frac{p-\omega}{p} = \frac{1+p-\omega}{p} = k$$

-w

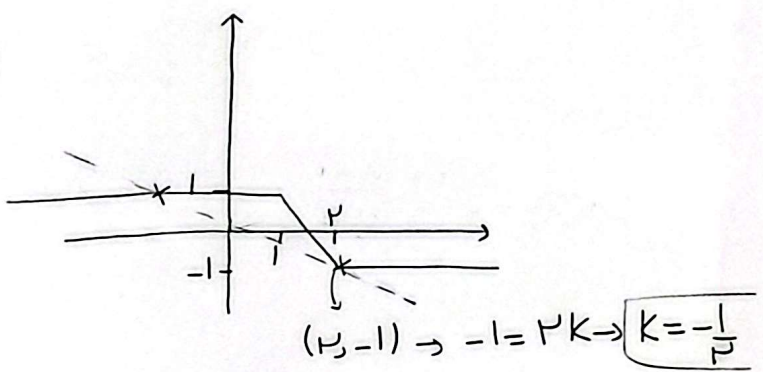
$$x=0 \quad \sqrt{bx+c} \quad bx+c \geq 0 \rightarrow x \geq -\frac{c}{b} \quad -\frac{c}{b} = p \rightarrow c = -pb$$

$$f(p)=1 \rightarrow \sqrt{pb+c}=1 \rightarrow pb+c=1 \rightarrow b=1 \quad c=-p$$

$$g(x) = \sqrt{x^p + p} \quad x^p \geq 0 \rightarrow x^p + p \geq p \rightarrow \sqrt{x^p + p} \geq p$$

-y

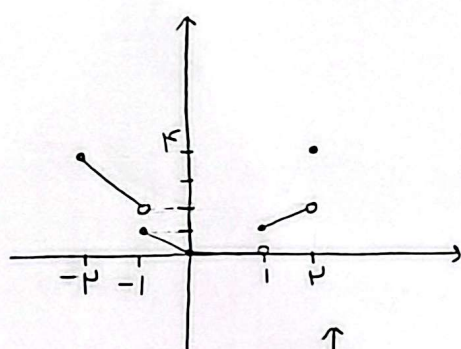
$$\begin{aligned} & \lambda - p - \lambda + 1 = -1 \\ & -\lambda + p - \lambda + 1 = -p\lambda + p \\ & -\lambda + p + \lambda - 1 = 1 \end{aligned}$$



-v

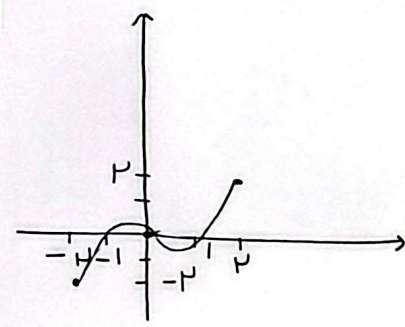
$$\begin{aligned} -p \leq x < -1 &\rightarrow [x] = -p \rightarrow y = -px \\ 0 \leq x < 1 &\rightarrow [x] = 0 \rightarrow y = 0 \\ x = +p &\rightarrow [x] = p \rightarrow y = p \end{aligned}$$

$$\begin{aligned} -1 \leq x < 0 &\rightarrow [x] = -1 \rightarrow y = -x \\ 1 \leq x < p &\rightarrow [x] = 1 \rightarrow y = x \end{aligned}$$



$$Rf = [0, p] - \{p\}$$

$$\cup \quad \begin{aligned} x < 0 &\rightarrow -x^p - x \\ x > 0 &\rightarrow x^p - x \end{aligned}$$



$$Rf = [-p, p]$$

-A

$$y = \frac{x+1+x+1}{x^p+x} = \frac{p x + p}{x^p+x} = y \rightarrow y x^p + y x = p x + p$$

$$\rightarrow y x^p + x(y-p) - p = 0$$

$$x = \frac{p-y \pm \sqrt{y^p - p y + p + 4y}}{py} = \frac{p-y \pm \sqrt{y^p + p y + p}}{py}$$

$y \neq 0$

$$y = -p \rightarrow \frac{p - (-p) + (-p + p)}{-p} = -1 \rightarrow x = -1 \rightarrow \text{مقرَّب سده}$$

$$\frac{(\sqrt{x}-1)(\sqrt{x}-\mu)}{(\sqrt{x}-1)(\sqrt{x}-1)} = \frac{\sqrt{x}-\mu}{\sqrt{x}-1} = y \rightarrow y\sqrt{x}-y = \sqrt{x}-\mu$$

$$\sqrt{x}(y-1) = y-\mu \rightarrow \sqrt{x} = \frac{y-\mu}{y-1}$$

$$\frac{y-\mu}{y-1} \geq 0 \rightarrow \frac{+1}{+1} \frac{-\mu}{-1} \frac{+}{+} \quad y > \mu \cup y < 1$$

$$\frac{x^\mu(x+\mu)-(x+\mu)}{x^\mu-1} = \frac{(x+\mu)(x^\mu-1)}{x^\mu-1} = x+\mu$$

$$x^\mu-1 \neq 0 \rightarrow x \neq \pm 1 \rightarrow y \neq \mu, 1$$

$$\mu+1 = \mu$$

-10

9