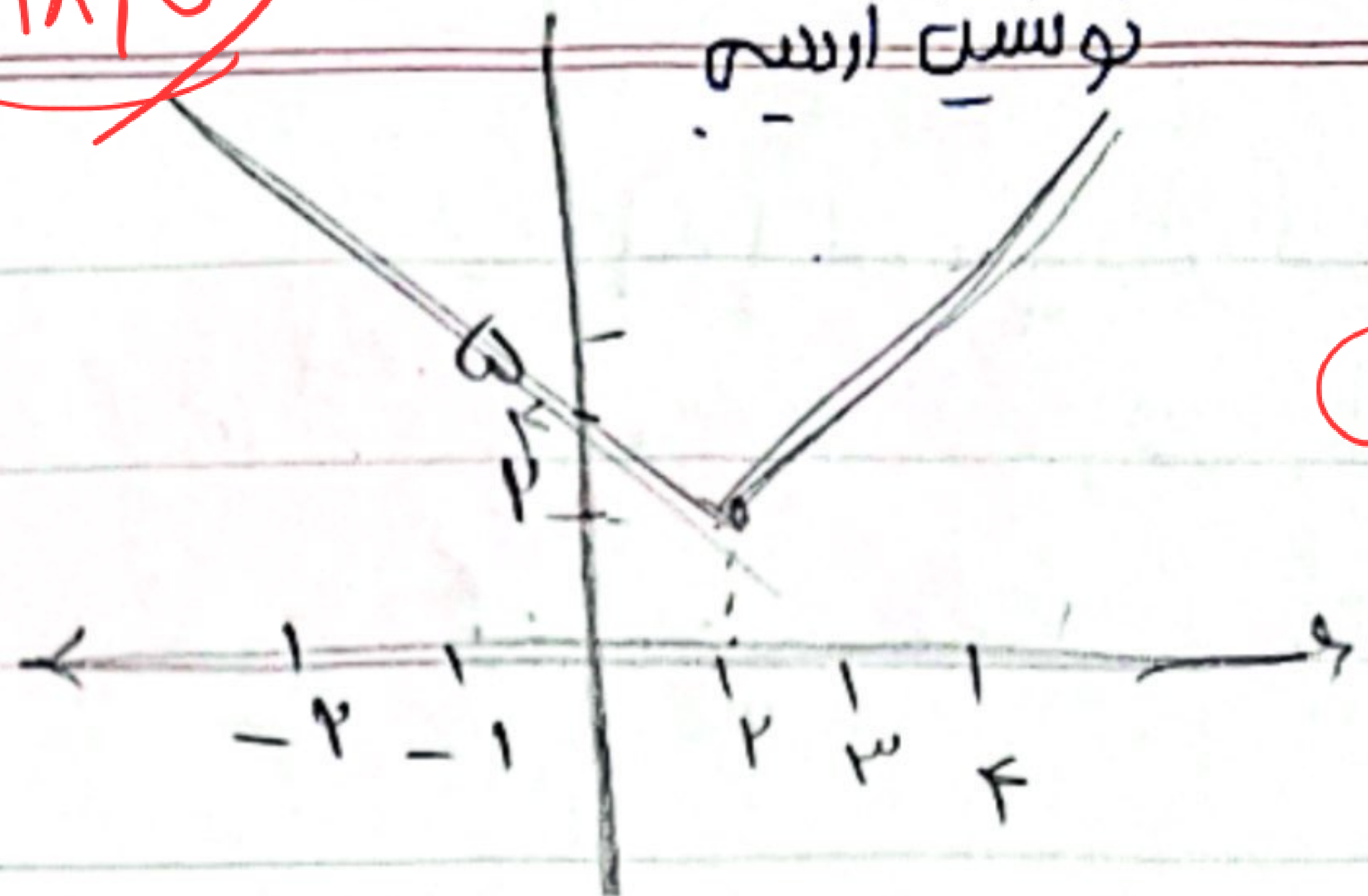


11, 5

نوشته ارسبی

الف) $y = x + |2x - 4|$

$$y = \begin{cases} x + 2x - 4 & x \geq 2 \\ 2 & x = 2 \\ x - 2x + 4 & x < 2 \end{cases}$$



11
5

$$\Rightarrow \begin{cases} 3x - 4 & x \geq 2 & R_f = [2, +\infty) \\ 2 & x = 2 & \neq 2 \\ -x + 4 & x < 2 & R_f = [2, +\infty) \end{cases} \quad R_f = [2, +\infty)$$

ب) $y = |x - 2| + |x - 1| + |x|$

$$\begin{cases} x - 2 + x - 1 - x & x \geq 2 \\ -x + 2 + x - 1 - x & x \geq 1 \\ -x + 2 - x + 1 - x & x \geq 0 \end{cases}$$

$$\Rightarrow \begin{cases} x - 3 & x \geq 2 \\ -x + 1 & x \geq 1 \\ -3x + 3 & x \geq 0 \end{cases}$$

$R_f = [-1, +\infty)$

$|3x - 3| - |x + 2| = k \quad k = ?$

$k = -2$

11, 5

$$\begin{cases} -3x + 3 + x + 2 & x < -2 \\ -3x - 3 - x - 2 & -2 \leq x < 1 \\ 3x - 3 - x - 2 & x \geq 1 \end{cases}$$

$(9, +\infty)$

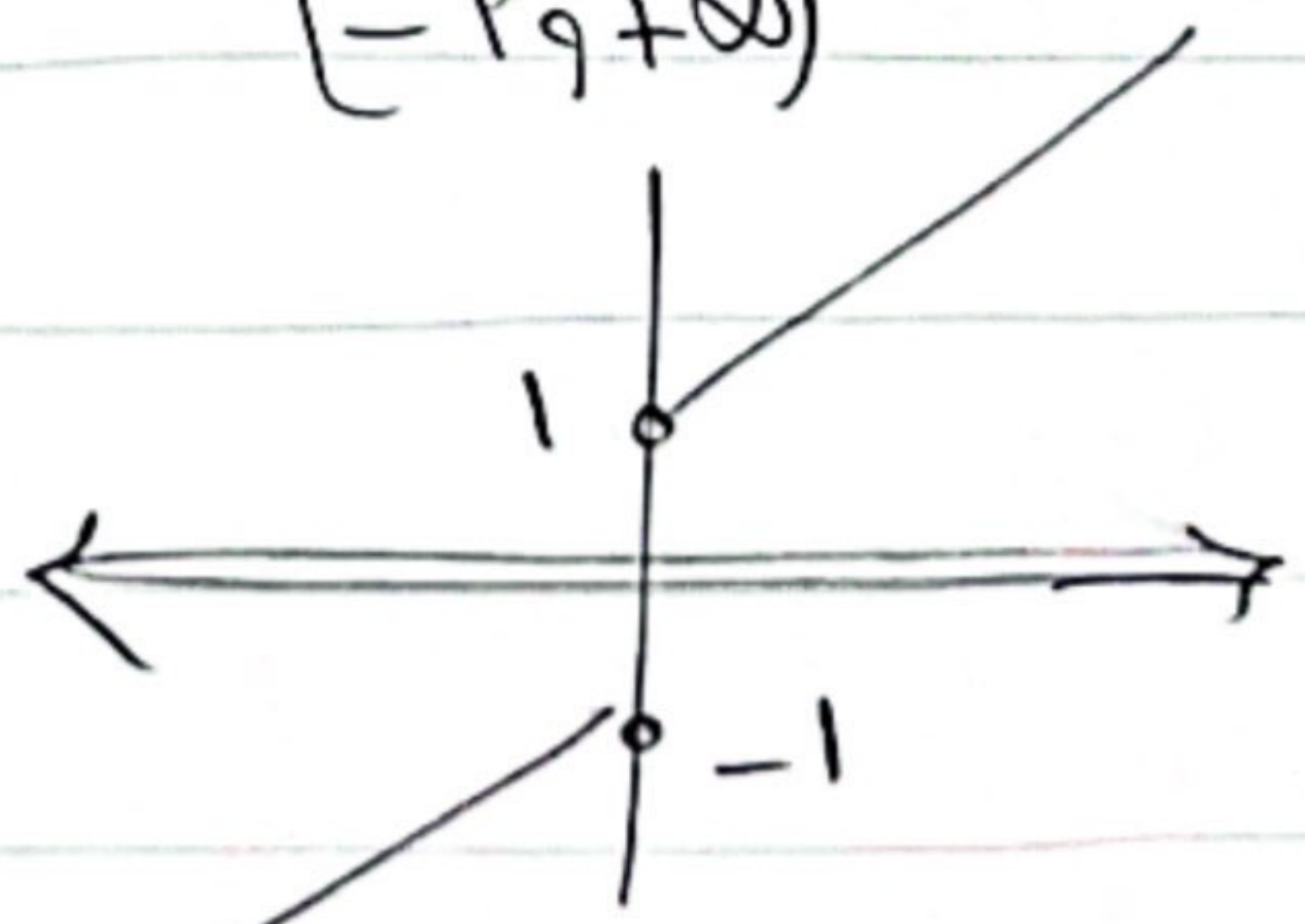
$(-3, 9]$

$[-3, +\infty)$

$k = 9$

$\Rightarrow R_f = [-3, 9]$

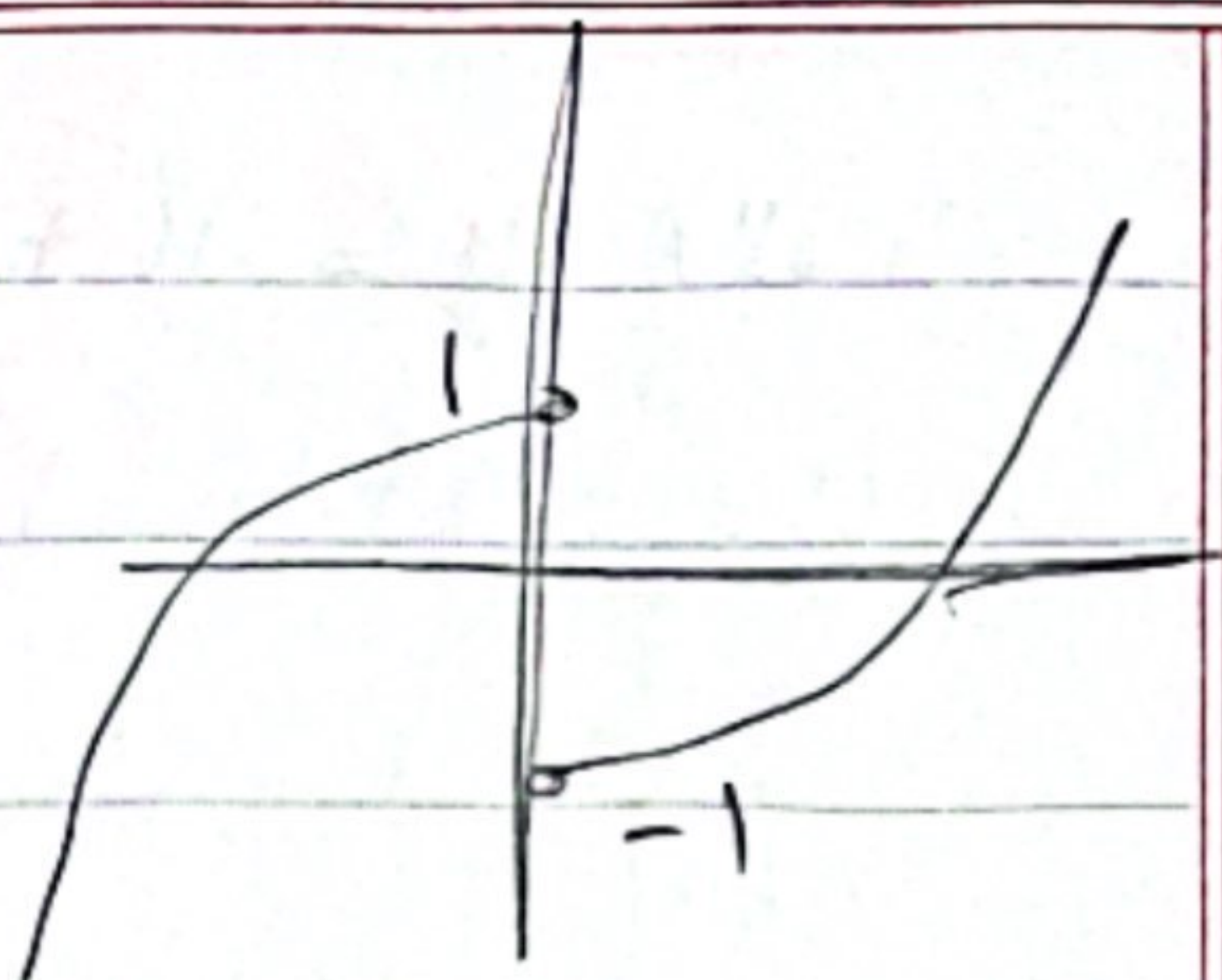
الف) $x + \frac{x}{|x|} = y \quad x \neq 0$
 $|x| = x$



if $x > 0 \quad x + \frac{x}{x} = x + 1 \quad R_f = [1, +\infty) \quad R_f = (-\infty, -1]$
 if $x < 0 \quad x + \frac{x}{-x} = x - 1 \quad R_f = (-\infty, -1] \quad \cup [1, +\infty)$

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$\hookrightarrow y = u|u| - \frac{u}{\ln|u|}$
 if $u > 0$ u^{p-1} $R_f = [0, +\infty)$
 if $u < 0$ $-u^{p+1}$ $R_f = (-\infty, 0]$



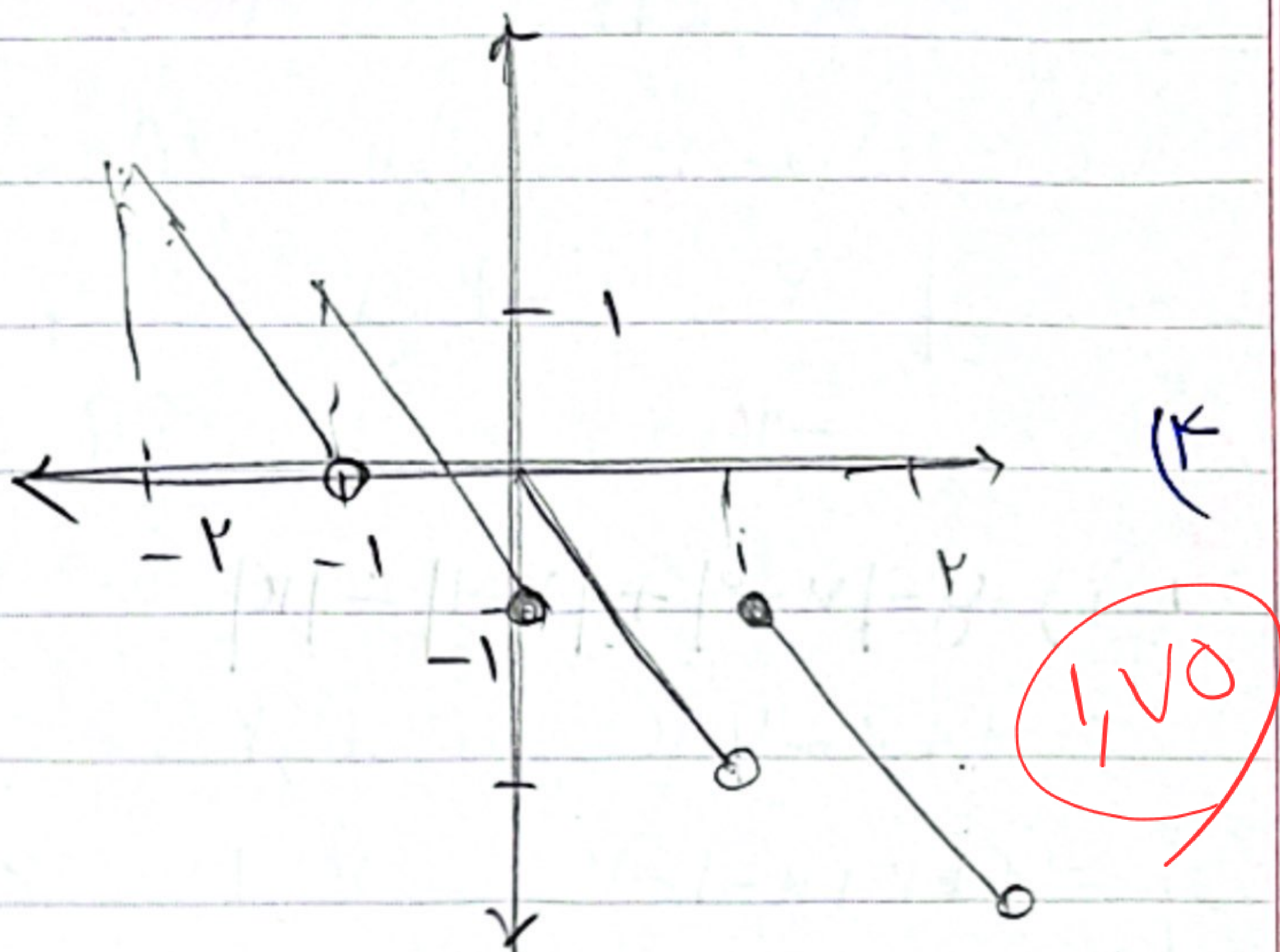
$R_f = \mathbb{R}$

ii) $y = [u] - pu$

$D_f = \mathbb{R}$

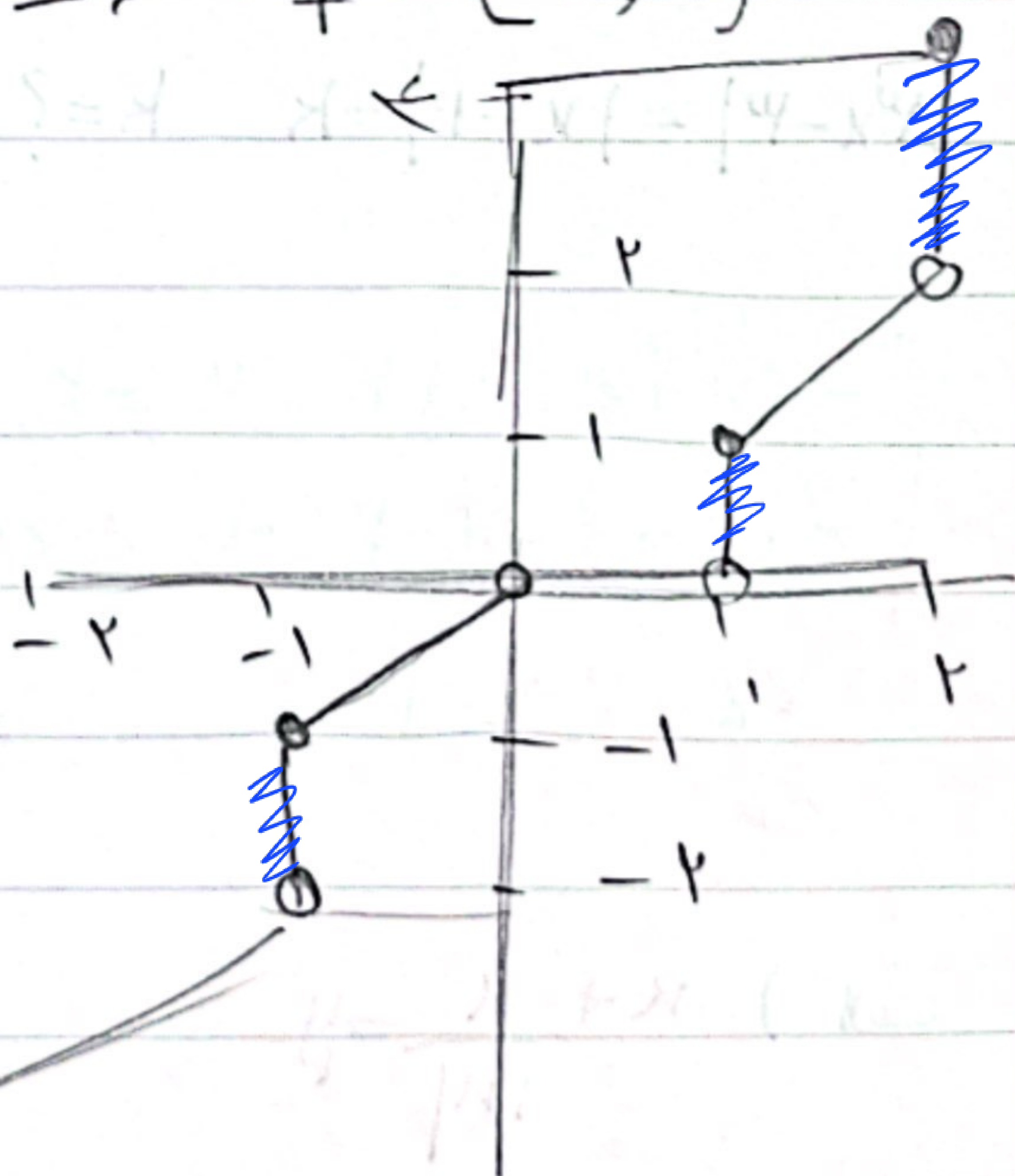
$[-p, p]$ (Sobolev)

$D_f = [-p, p]$



iii) $y = [u]/K$

$D_f = \mathbb{R} \Rightarrow \text{Sobolev} \Rightarrow D_f = [-K, K]$



الف) $y = 3u - [3u]$

(5)

صفت فروول $0 \leq K[u] < 1$

$\mathbb{R} \quad 3u - 3[u] = [0, 1)$

ب) $y = 4u - 4[u]$ $y = 4(u - [u])$ $\mu = [0, 4)$

ج) $y = u - \omega \left[\frac{u}{\omega} \right]$

$R_f = [0, \omega)$

د) $y = [2u] - 2u$

$[2u] \leq 2u$ $\mu = (-1, 0]$

الف) $y = 3 \sin u + 4 \cos u$

(4)

$-\sqrt{3^2 + 4^2} \leq 3 \sin u + 4 \cos u \leq \sqrt{3^2 + 4^2}$

$R = [-\sqrt{13}, +\sqrt{13}]$

(1, 1.70)

ب) $y = 4 \sin u - 3 \cos u$

$-1 < \sin u, \cos u < 1$

$R_f = [-5, 5]$

$\sin^2 u + \cos^2 u = 1$

$$ج) [\sqrt{29} \sin u + \omega \cos u] = y$$

$$-\sqrt{29 + \omega^2} < \sqrt{29} \sin u + \omega \cos u < \sqrt{29 + \omega^2}$$

$$-\sqrt{29} < \sqrt{29} \sin u + \omega \cos u < \sqrt{29}$$

$$\omega < \sqrt{29} < 4$$

$$-\omega > -\sqrt{29} > -4$$

$$D = [-\sqrt{29}, +\sqrt{29}] = \begin{cases} -\omega & 1 \\ -\sqrt{29} & 2 \\ -\frac{13}{2} & 3 \\ -\frac{1}{2} & 4 \\ -1 & 5 \\ 0 & 6 \end{cases}$$

$$د) y = \sqrt{\cos u - 1} \sin u$$

$$\cos u - 1 \sin u \geq 0$$

$$\frac{\cos u}{\sin u} \geq 1$$

$$\sin u \neq 0$$

$$R_f = \sqrt{[-\sqrt{5}, \sqrt{5}]} = [0, \sqrt{5}]$$

ضرب در

$$الف) y = 0 \sin^2 u + 1 \sin u + 1$$

$$\sin = 1$$

$$y = 4$$

$$\sin = -1$$

$$y = 0$$

$$R = [0, 4]$$

$$\sin = -\frac{b}{1a} = -\frac{1}{1}$$

$$\sin u \neq -\frac{1}{1}$$

$$\sin u \neq -\frac{1}{1}$$

$$ب) y = 1 \sin^2 u + 1 \sin u + 1$$

$$\sin = 0$$

$$y = 1$$

$$\sin = 1$$

$$y = 1$$

$$R = [\frac{1}{14}, 1]$$

$$\sin = -\frac{b}{1a} = -\frac{1}{1}$$

$$y = \frac{1}{14}$$

$$y = \frac{1}{14}$$

$$الف) y = \sin^4 u + \cos^4 u$$

$$\frac{1}{2} < \sin^4 u + \cos^4 u < 1$$

$$R = (\frac{1}{2}, 1]$$

$$\frac{1}{2} < \sin^4 u + \cos^4 u < 1$$

$$\frac{1}{2} < \sin^4 u + \cos^4 u < 1$$

$$ب) y = \left[\sin^2 u + \cos^2 u \right]$$

$p=1, q=1$
 $\sin^2 u + \cos^2 u = 1$

$$\frac{1}{1} < \sin^2 u + \cos^2 u \leq 1$$

$$\therefore R[\sin^2 u + \cos^2 u] = \{0, 1\}$$

$$الف) y = \sin^2 u + k \cos^2 u$$

$$y = \sin^2 u + \cos^2 u + k \cos^2 u = [1, k] = R$$

(1, 0)

$$1 + k \cos^2 u$$

$[0, k]$

$$ب) y = \frac{k \cot u}{1 + \cot^2 u} = \frac{k \cot u}{\frac{1}{\sin^2 u}} = \frac{\sin^2 u \cdot k \cot u}{\sin^2 u \cdot \cot u} =$$

$$k \sin u \cos u = \sin 2u \rightarrow R = [-1, 1]$$

$$الف) y = \frac{kx^2 + vx - k}{x + k}$$

$$y = vx - 1, \quad x \neq -k$$

$$R = \mathbb{R} - \{ -1 \}$$

(1, 0)

$$ب) y = \frac{(x^p - 1)}{x - 1} = \frac{(x - 1)(x^{p-1} + x^{p-2} + \dots + 1)}{x - 1} = (-\frac{1}{p})^p - \frac{1}{p} + 1 = \frac{p}{p}$$

$$-\frac{b}{pa} = -\frac{1}{p}$$

$$R = [\frac{p}{p}, +\infty)$$