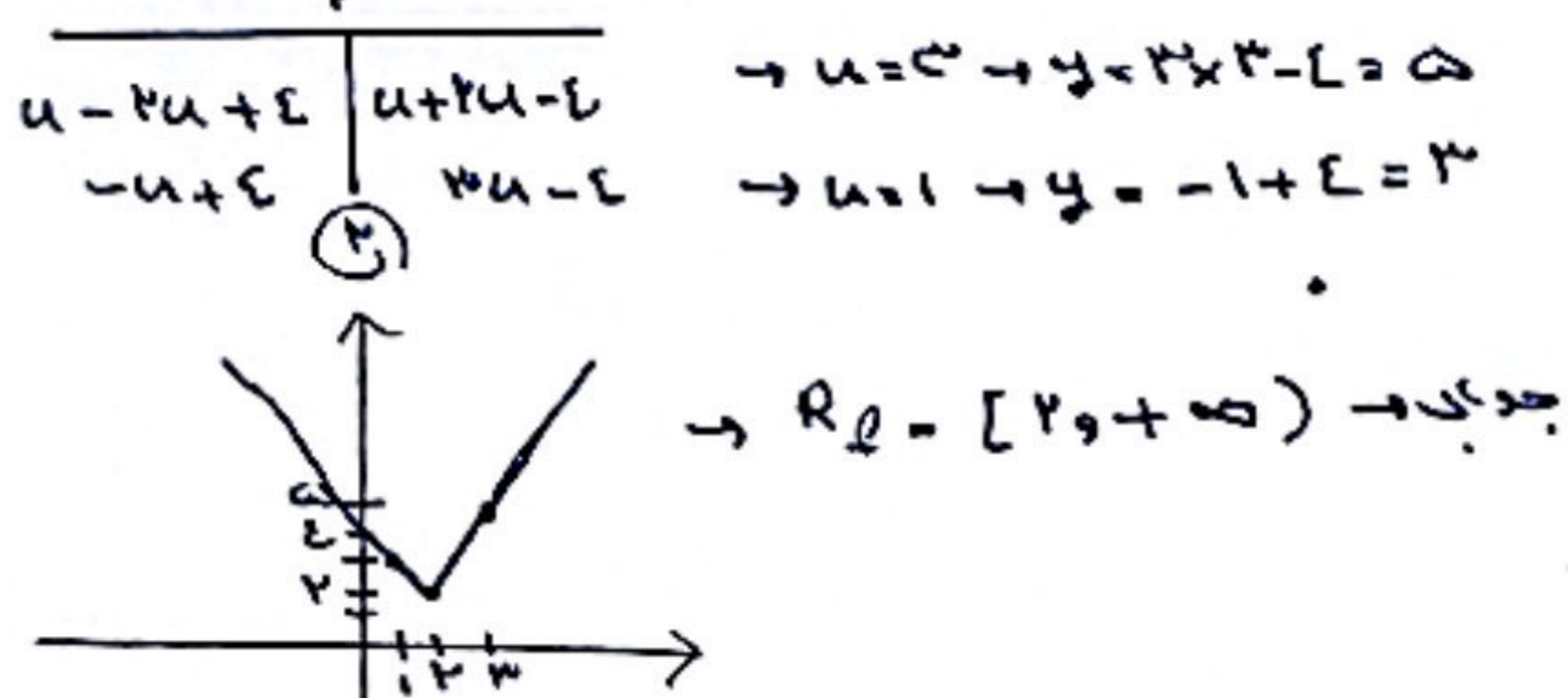
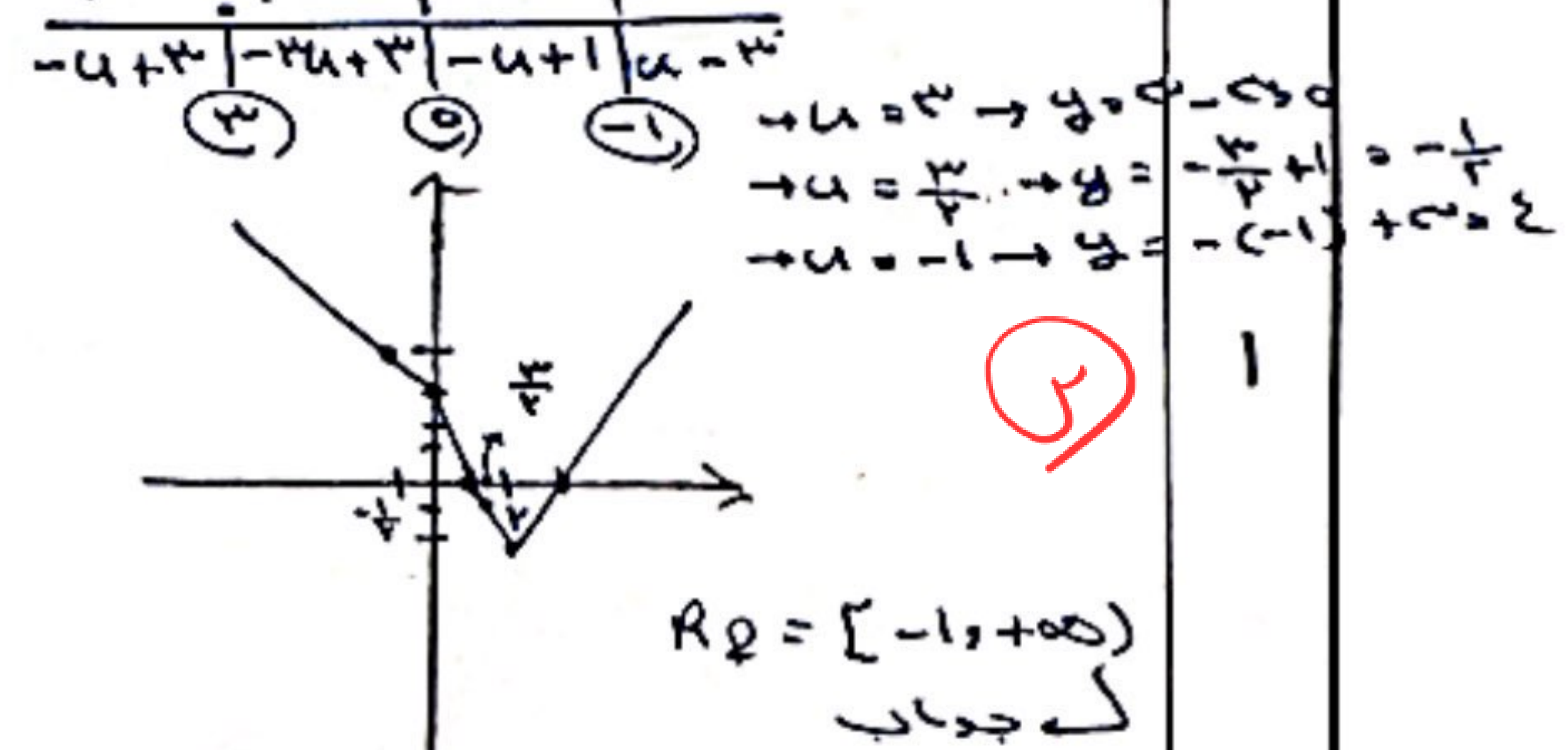


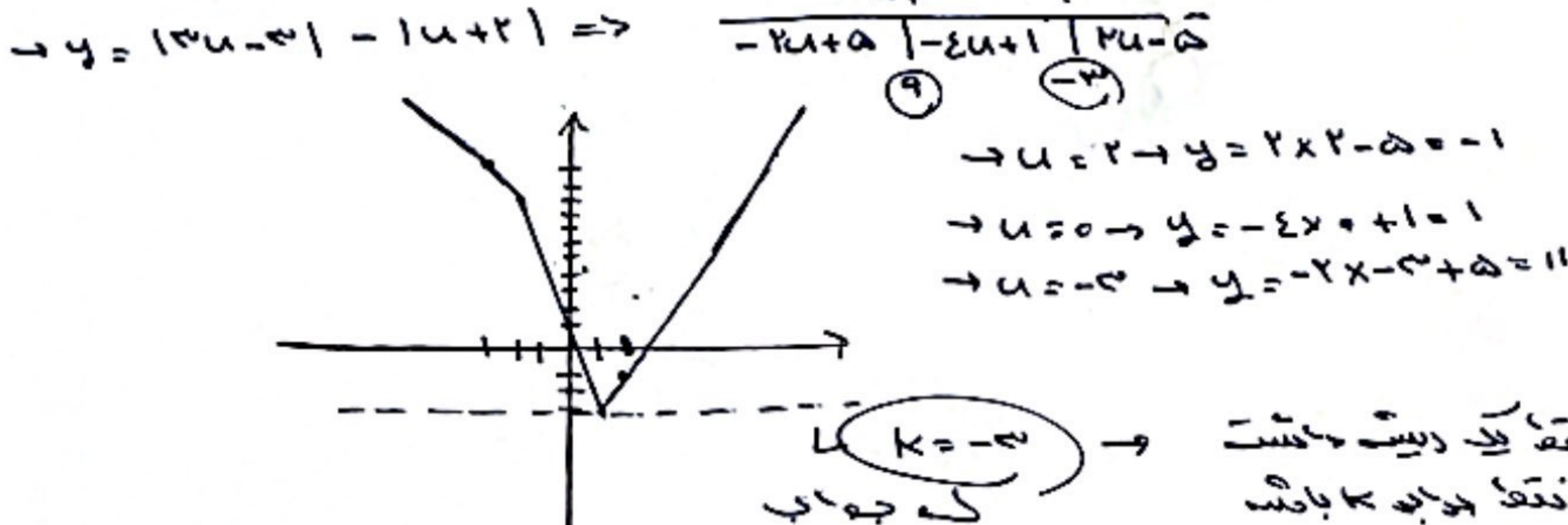
الف) $y = u + |2u - 2|$



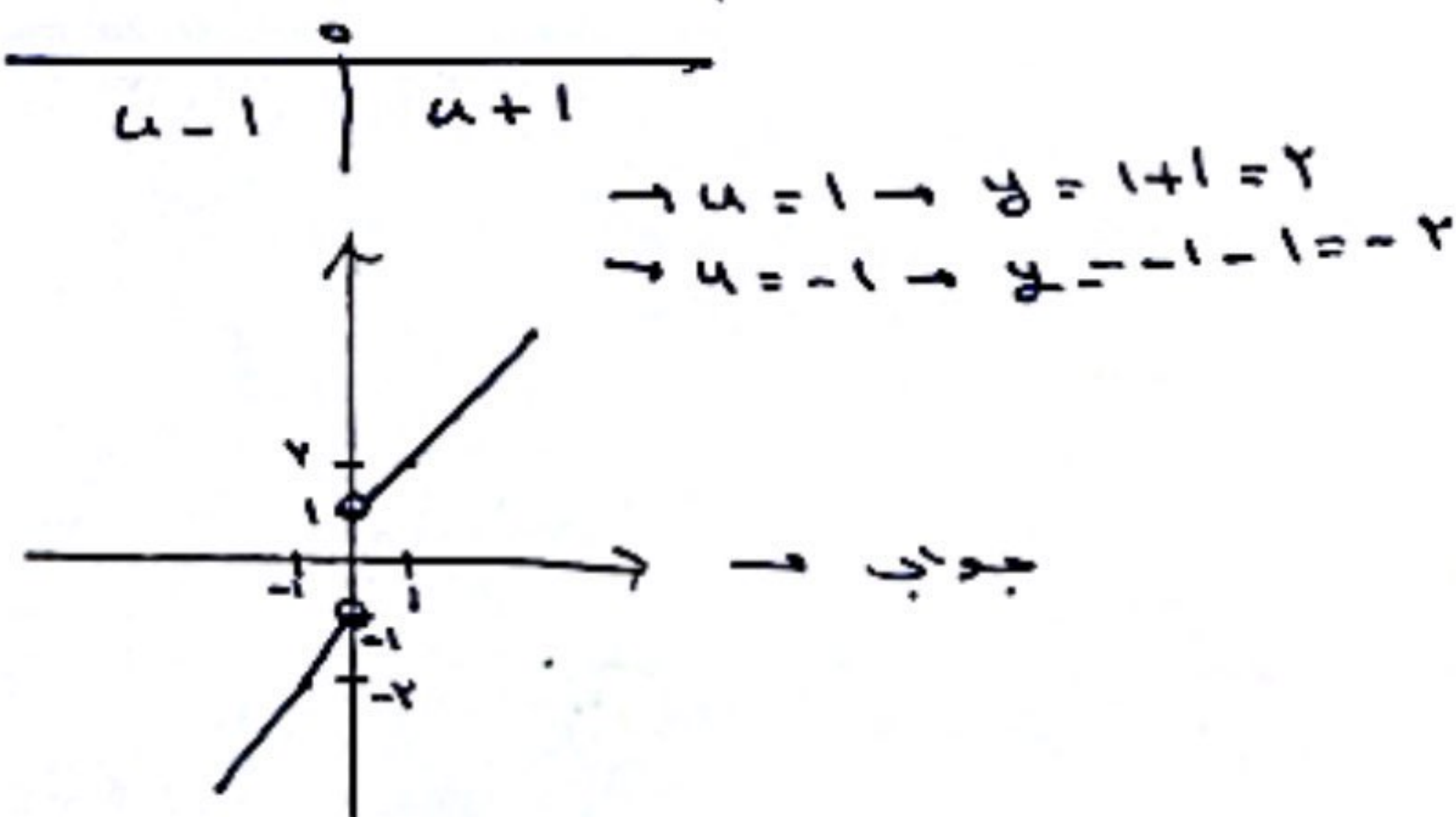
ب) $y = |u - 2| + |u - 1| - |u|$



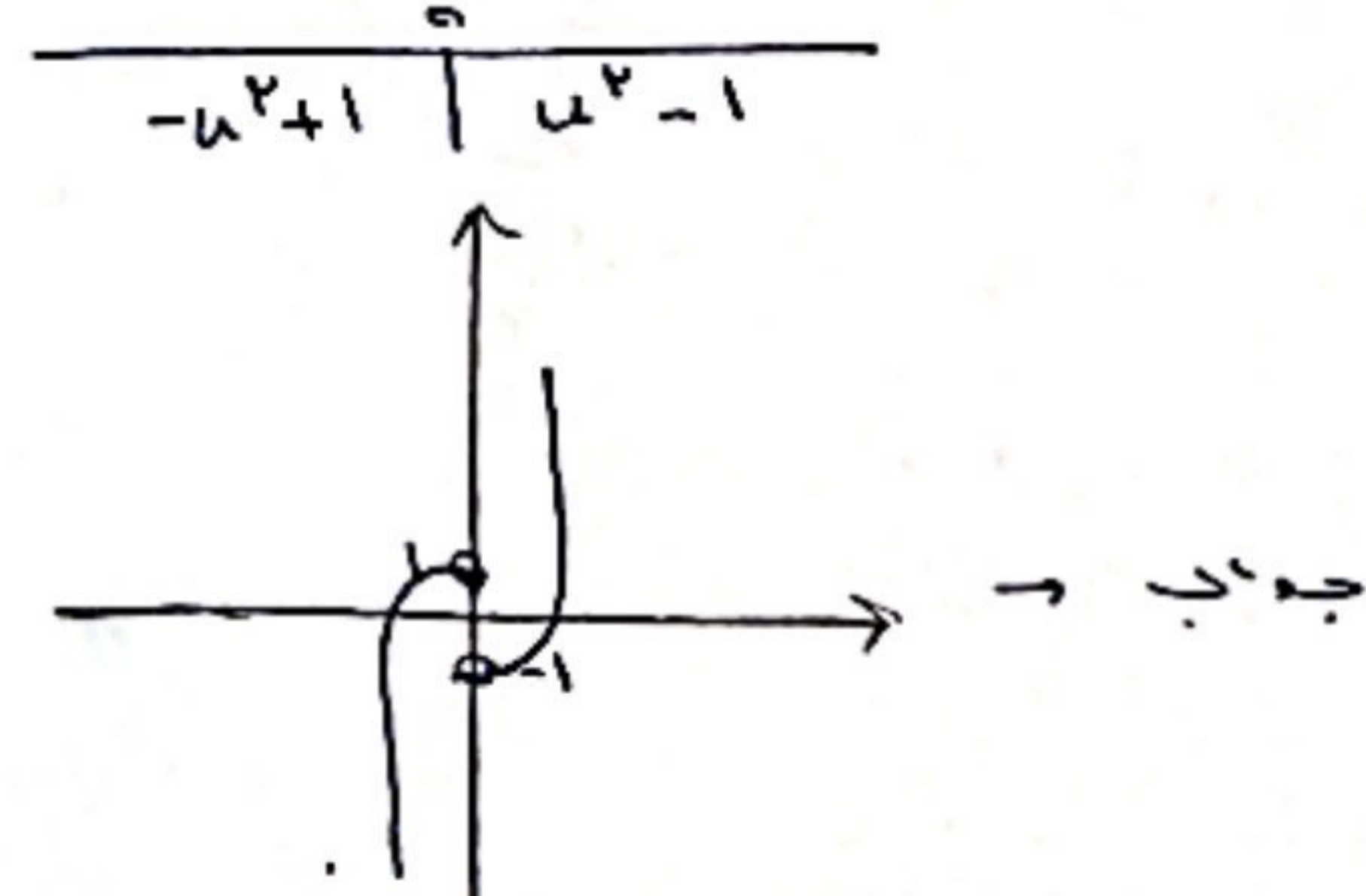
$|3u - 3| - |u + 2| = k$



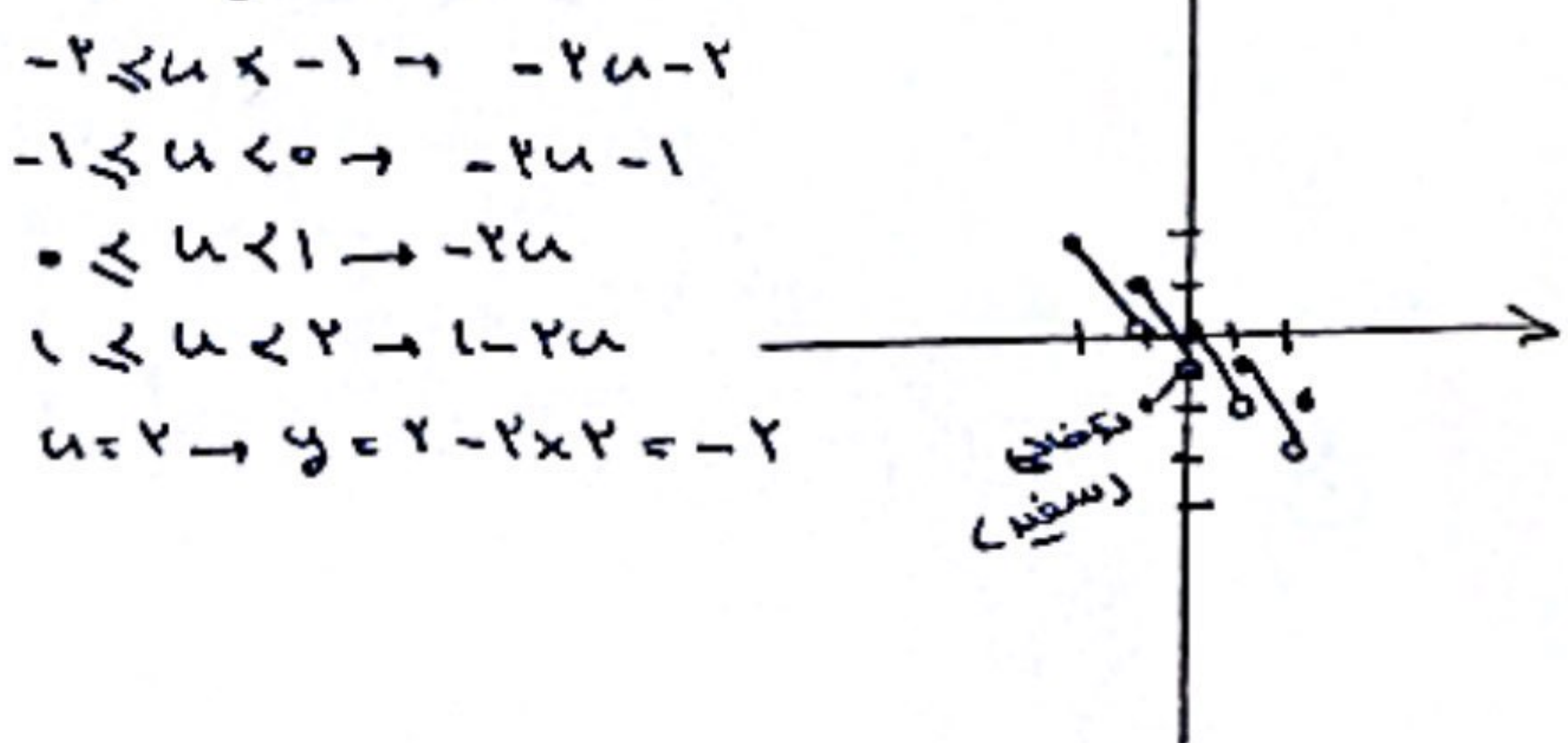
الف) $y = u + \frac{u}{|u|} \rightarrow u \neq 0$



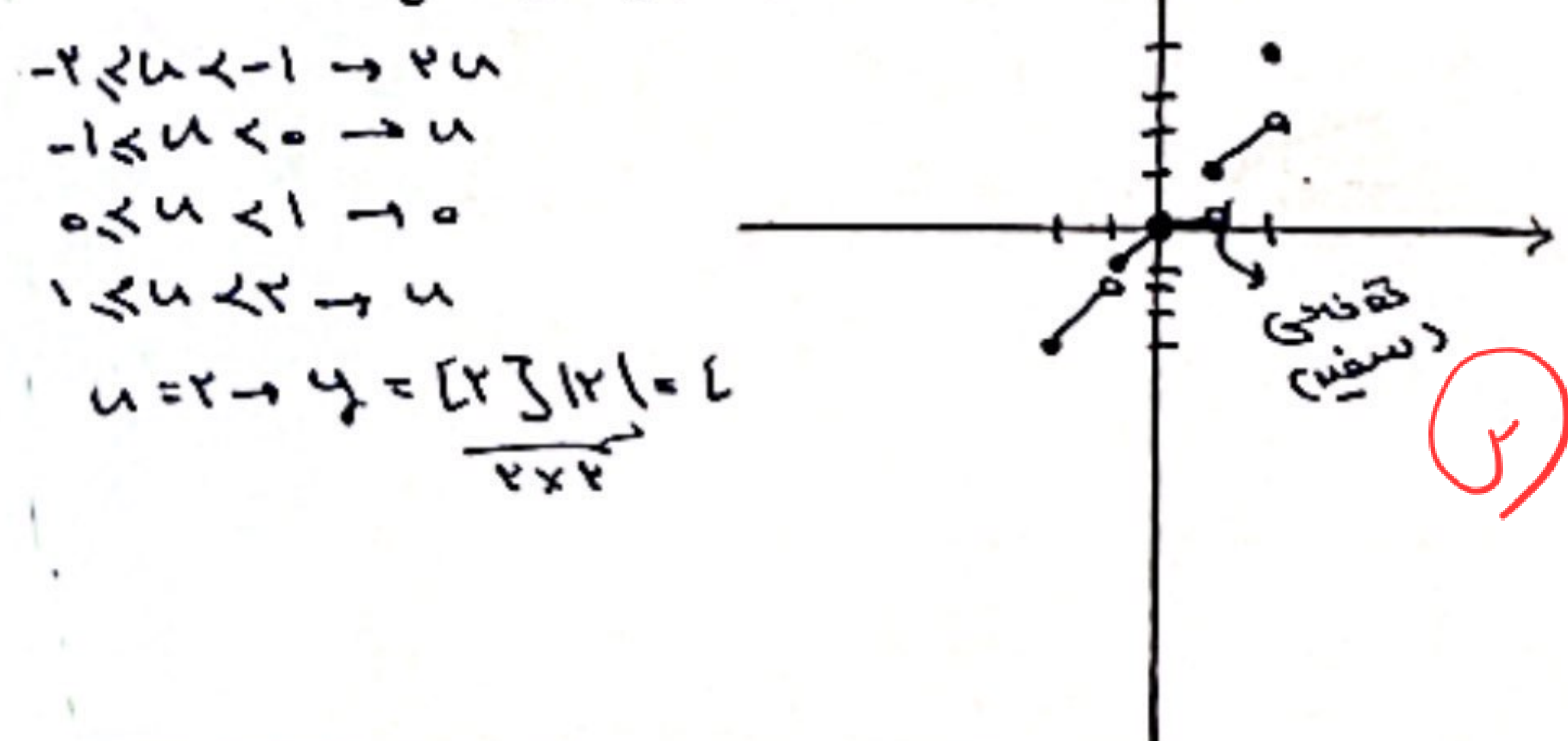
ب) $y = u|u| - \frac{u}{|u|} \rightarrow u \neq 0$



الف) $y = [u] - 2u$



ب) $y = [u]|u|$



الف) $y = 3u - [3u] \rightarrow 0 \leq y < 3 \rightarrow R_f = [0, 3) \rightarrow$ جواب

ب) $y = 2u - 2[u] \Rightarrow 2(u - [u]) \Rightarrow 0 \leq y < 2 \rightarrow R_f = [0, 2) \rightarrow$ جواب

ج) $y = u - 5[\frac{u}{5}] \rightarrow 0 \leq y < 5 \rightarrow R_f = [0, 5) \rightarrow$ جواب

د) $y = [2u] - 2u = -(2u - [2u]) \rightarrow 0 \leq 2u - [2u] < 2 \rightarrow$ جواب

$\rightarrow -1 < [u] - 2u \leq 0 \rightarrow R_f = (-1, 0] \rightarrow$ جواب

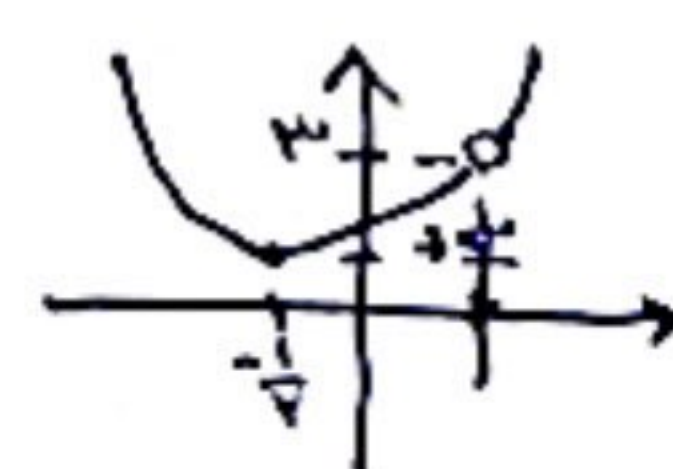
1) $y = r \sin u + r \cos u \rightarrow -\sqrt{14} \leq r \sin u + r \cos u \leq \sqrt{14} \rightarrow R_f = [-\sqrt{14}, \sqrt{14}] \rightarrow \text{جواب}$
 2) $y = 2 \sin u - r \cos u \rightarrow -\sqrt{14+9} \leq 2 \sin u - r \cos u \leq \sqrt{14+9} \rightarrow -5 \leq 2 \sin u - r \cos u \leq 5$
 $\rightarrow R_f = [-5, 5] \rightarrow \text{جواب}$
 3) $y = [r \sin u + 4 \cos u] \rightarrow -\sqrt{17} \leq r \sin u + 4 \cos u \leq \sqrt{17} \rightarrow -4 \leq [r \sin u + 4 \cos u] \leq 4$
 $\rightarrow R_f = \{-4, -2, -1, 1, 2, 4\} \rightarrow \text{جواب}$
 4) $y = \sqrt{\cos u - r \sin u} \rightarrow -\sqrt{5} \leq \cos u - r \sin u \leq \sqrt{5} \rightarrow 0 \leq \sqrt{\cos u - r \sin u} \leq \sqrt{5}$
 $\rightarrow R_f = [0, \sqrt{5}] \rightarrow \text{جواب}$

1) $y = \sin^2 u + r \sin u + r$
 $\sin u = -1 \rightarrow 1 - r + r = 0$
 $\sin u = 1 \rightarrow 1 + r + r = 4 \rightarrow R_f = [0, 4] \rightarrow \text{جواب}$
 $\sin u = -\frac{b}{ra} = -\frac{r}{r} \rightarrow \text{جواب}$
 2) $y = r \sin^2 u + r \sin u + r$
 $\sin u = -1 \rightarrow r - r + r = 1 \rightarrow R_f = [\frac{r}{2}, 4] \rightarrow \text{جواب}$
 $\sin u = 1 \rightarrow r + r + r = 4$
 $\sin u = -\frac{b}{ra} = -\frac{r}{r} \rightarrow \frac{r}{2}$

1) $y = \sin^2 u + 2 \cos^2 u \rightarrow 1 + r \cos^2 u \rightarrow 0 \leq \cos^2 u \leq 1 \rightarrow 0 \leq r \cos^2 u \leq r$
 $\rightarrow 1 \leq 1 + r \cos^2 u \leq 2 \rightarrow R_f = [1, 2] \rightarrow \text{جواب}$
 2) $y = \frac{r \cot u}{1 + \cot^2 u} = \left(\frac{\frac{r \cos u}{\sin u}}{\frac{\cos^2 u + \sin^2 u}{\sin^2 u}} \right) = r \sin u \cos u \rightarrow y = r \sin u \cos u = \sin 2u$
 $\rightarrow -1 \leq \sin u \leq 1 \rightarrow -1 \leq \sin 2u \leq 1 \rightarrow R_f = [-1, 1] \rightarrow \text{جواب}$

1) $y = \sin^4 u + \cos^4 u \rightarrow \frac{1}{2} \leq \sin^4 u + \cos^4 u \leq 1 \rightarrow \frac{1}{2} \leq \sin^4 u + \cos^4 u \leq 1$
 $\rightarrow R_f = [\frac{1}{2}, 1] \rightarrow \text{جواب}$
 2) $y = [\sin^4 u + \cos^4 u] \rightarrow \frac{1}{2} \leq \sin^4 u + \cos^4 u \leq 1 \rightarrow \frac{1}{2} \leq \sin^4 u + \cos^4 u \leq 1$
 $\rightarrow 0 \leq [\sin^4 u + \cos^4 u] \leq 1 \rightarrow R_f = \{0, 1\} \rightarrow \text{جواب}$

1) $y = \frac{ru^2 + 4u - 2}{u+2} = ru - 1$
 $\frac{ru^2 + 4u - 2}{u+2} \div \frac{u+2}{ru-1}$
 $\frac{ru^2 + 4u - 2}{ru^2 + 2ru - ru - 2} = \frac{ru^2 + 4u - 2}{ru^2 + ru - 2}$
 $\frac{-u - 2}{-u - 2} = 1$
 $\frac{u+2}{u+2} y = r \cdot (-2) - 1 = -9$
 $R_f = \{R, -9\} \rightarrow \text{جواب}$



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

$y = u^2 + u + 1 \rightarrow u_{\min} = -\frac{1}{2} \rightarrow y_{\min} = \frac{3}{4} \rightarrow R_f = [\frac{3}{4}, +\infty) \rightarrow \text{جواب}$