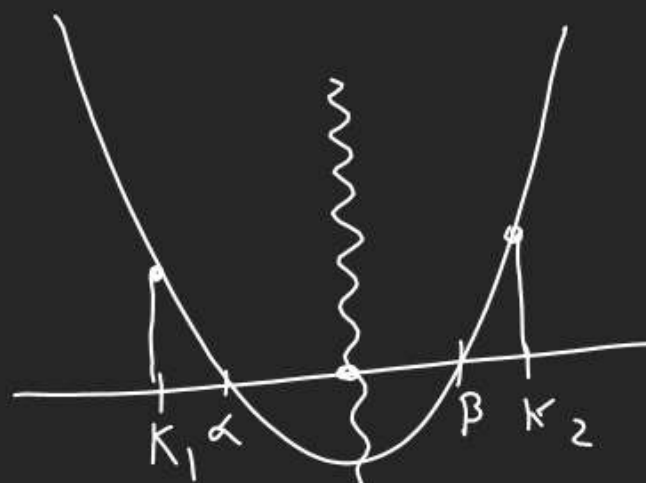
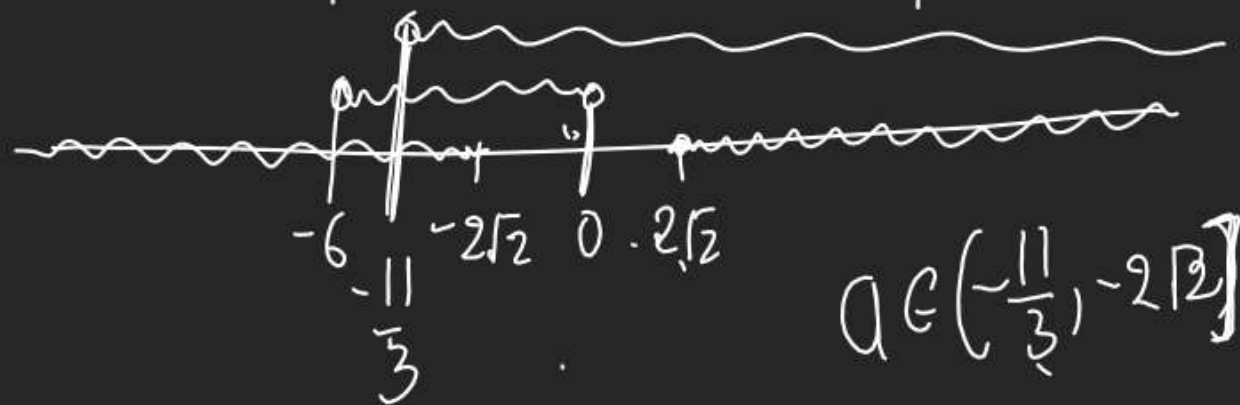


Profile 3 : Both Roots of $ax^2+bx+c=0$
are confined betⁿ (K_1, K_2)
(first last)

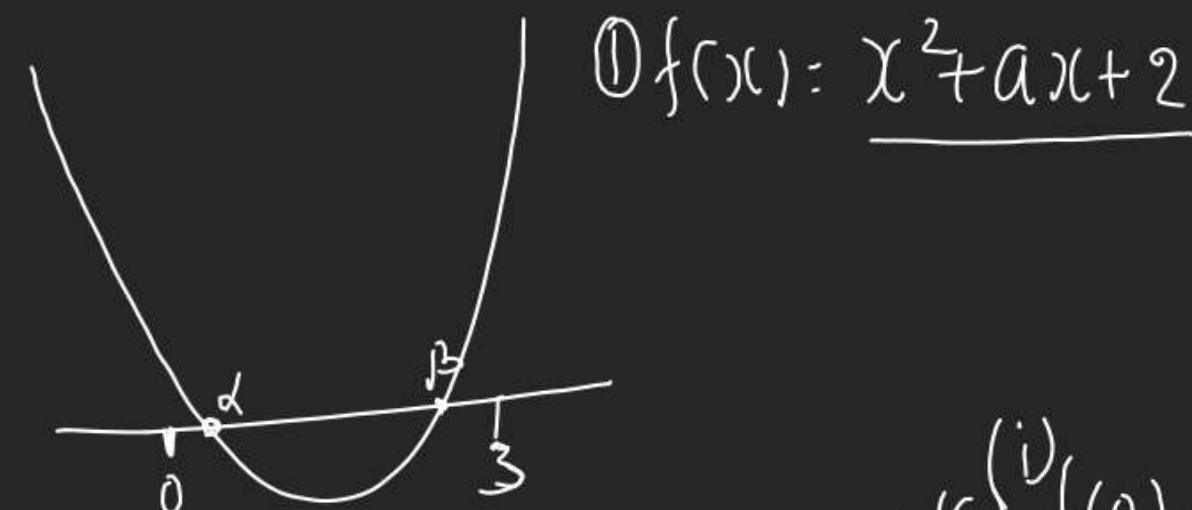


① $D \geq 0$ | ② $K_1 < -\frac{b}{2a} < K_2$ | ③ $f(K_1) > 0$
 $f(K_2) > 0$



$a \in (-\frac{11}{3}, -2]$

① If $x^2+ax+2=0$ has 2 Roots α & β
($\alpha \neq \beta$) & $\alpha, \beta \in (0, 3)$ find a ?



① $f(x) = x^2 + ax + 2$

(A) $D \geq 0$

$a^2 - 4 \times 1 \times 2 \geq 0$

$a^2 - 8 \geq 0$

$(a - 2\sqrt{2})(a + 2\sqrt{2}) \geq 0$

$a \leq -2\sqrt{2}$ or $a \geq 2\sqrt{2}$

(B) $0 < -\frac{a}{2 \times 1} < 3$

$0 < -\frac{a}{2} < 3$

$0 < -a < 6$

$-6 < a < 0$

-3.66

$a > -\frac{11}{3}$

(i) $f(0) > 0$

$0^2 + a \times 0 + 2 > 0$

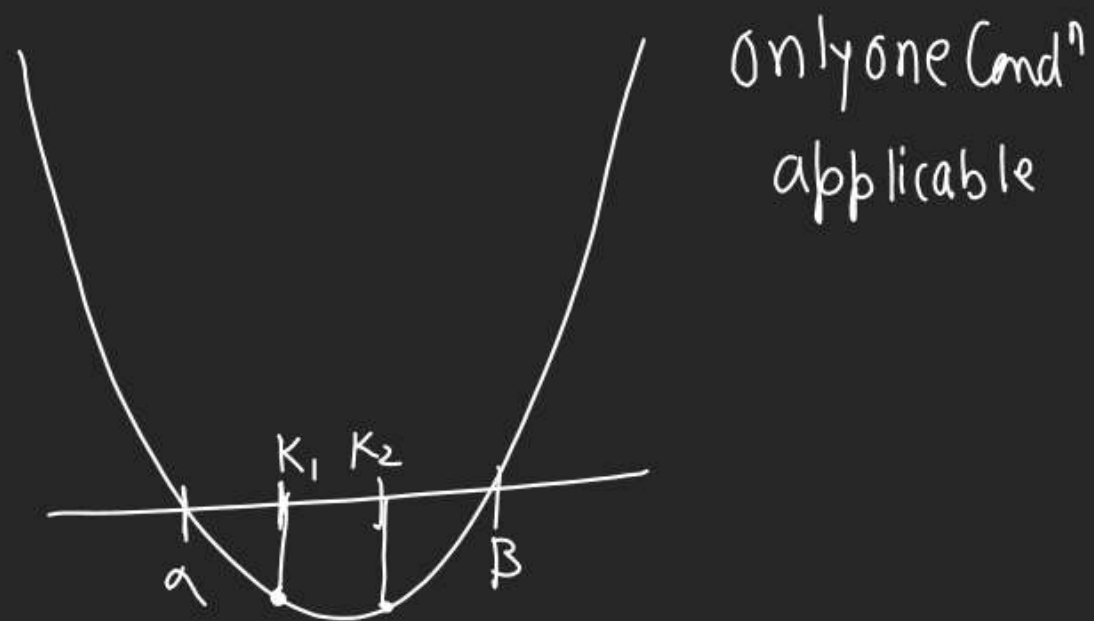
$2 > 0$

(ii) $f(3) > 0$

$9 + 3a + 2 > 0$

$3a > -11$

Max^m Profile 4 :- When constants k_1, k_2 like Proz lies betⁿ Root α & β .



(1) α, β already exists $\Rightarrow D \geq 0$ Not Req.

(2) Position of k_1, k_2 is not Specified $\Rightarrow -\frac{b}{2a}$ Condⁿ not Sure

(3) $f(k_1) < 0, f(k_2) < 0$

Q Find all values of k for which one root

Eqⁿ $(K-5)x^2 - 2Kx + K-4 = 0$ is smaller than 1

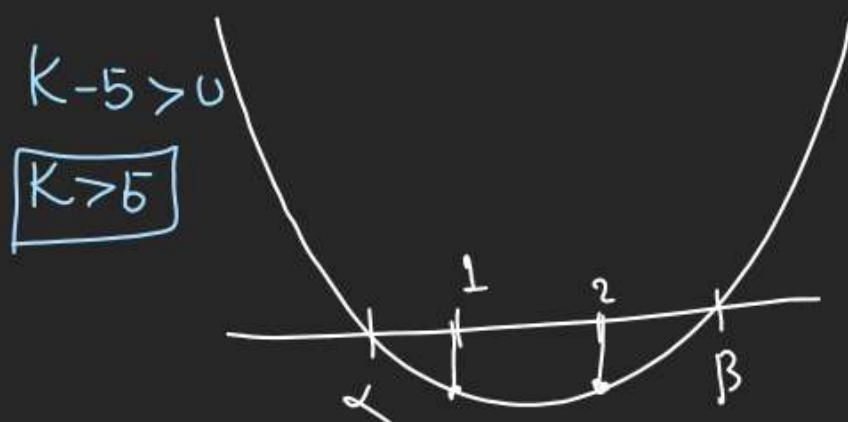
and other exceeds 2.

$$f(x) = x^2 - \frac{2K}{K-5}x + \frac{K-4}{K-5}$$



$K \in (5, 24)$

$5 < K < 24$



1, 2 lies betⁿ Root

Profile 4 $\frac{(K-24)}{(K-5)} < 0$

(1) $f(1) < 0$

$$1 - \frac{2K}{K-5} + \frac{K-4}{K-5} < 0$$

$$\frac{K-5-2K+K-4}{K-5} < 0 \Rightarrow \frac{-9}{K-5} < 0$$

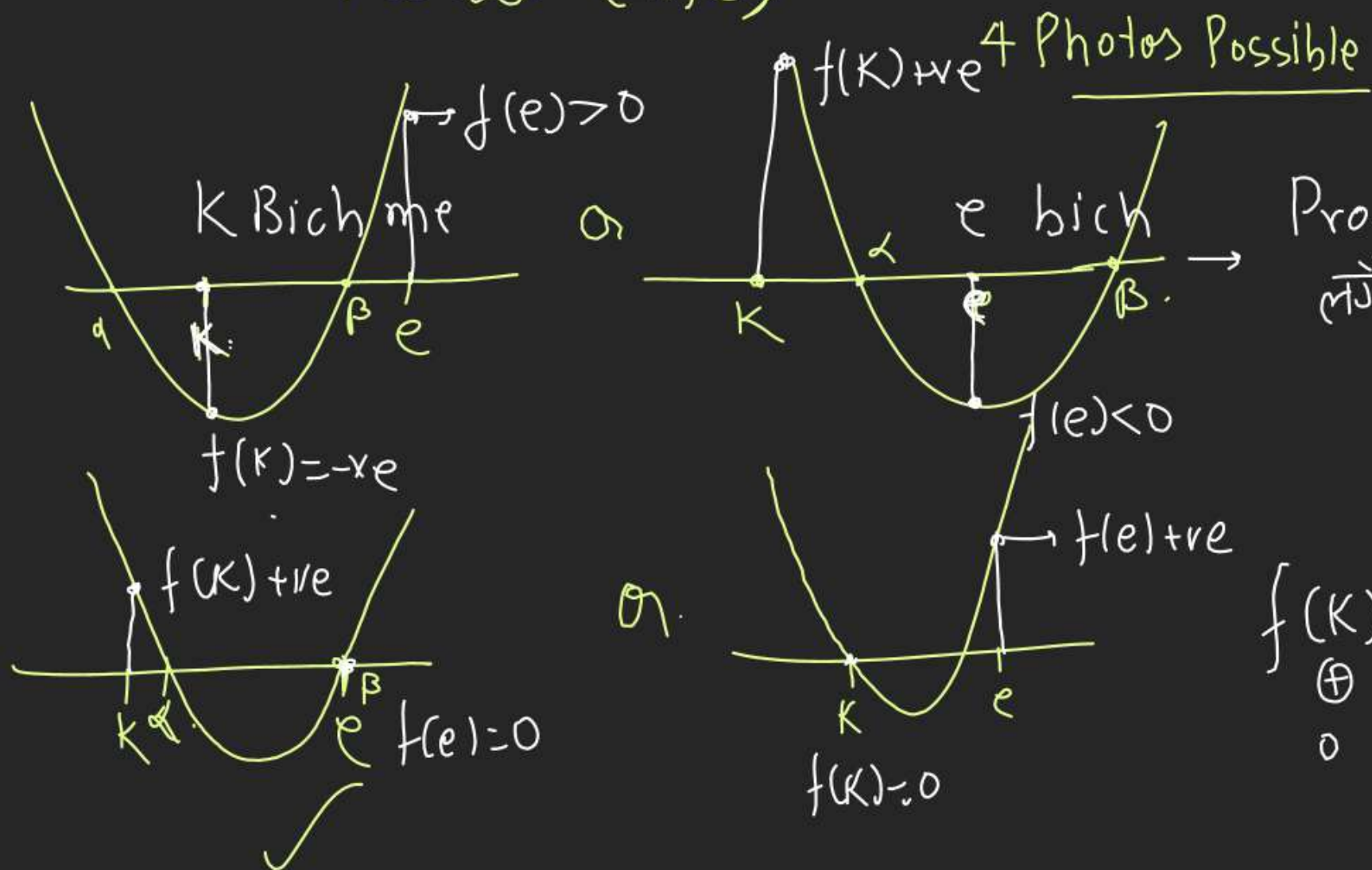
(2) $f(2) < 0$

$$4 - \frac{4K}{K-5} + \frac{K-4}{K-5} < 0$$

$$\frac{4K-20-4K+K-4}{K-5} < 0$$

hony Pacha

Profiles :- When exactly one Root of QEqn.
lies betⁿ (K, e)



Profile 2 \Rightarrow $f(K) > 0$, $f(e) < 0$

$$\left. \begin{array}{l} f(K) > 0, f(e) < 0 \\ f(K) < 0, f(e) > 0 \end{array} \right\} f(K) \cdot f(e) < 0$$

Condⁿ (check Separately)

$$f(K) \cdot f(e) = 0$$

$$\begin{array}{cc} \oplus & 0 \\ 0 & \oplus \end{array}$$

Q Find all value of a so that Eqⁿ $x^2 + (3-2a)x + a = 0$ has exactly one Root in $(-1, 2)$.

Probs $f(x) = x^2 + (3-2a)x + a$ $\begin{matrix} \nearrow \alpha \\ \searrow \beta \end{matrix}$

① $f(-1) \cdot f(2) < 0$

$(1 + (3-2a)(-1) + a)(4 + 2(3-2a) + a) < 0$ (2) $f(2) = 0 \rightarrow \beta = 2$

$(1 - 3 + 2a + a)(4 + 6 - 3a) < 0$

$(3a-2)(10-3a) < 0$

$(3a-2)(3a-10) > 0$

$a \in (-\infty, \frac{2}{3}] \cup [\frac{10}{3}, \infty)$ $a < \frac{2}{3} \vee a > \frac{10}{3}$

(checking 2nd condⁿ)

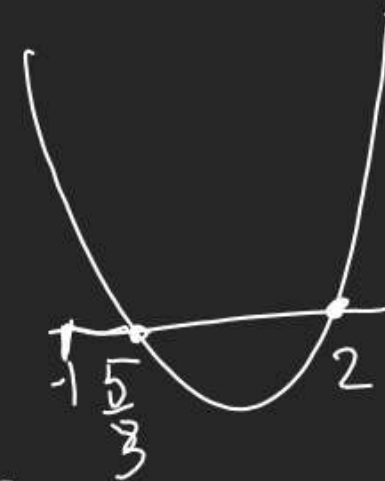
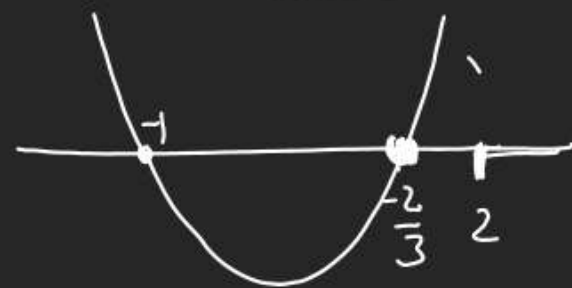
① $f(-1) = 0 \rightarrow \alpha = -1$ Rakhne $\alpha < 0 \Rightarrow \alpha = -1$

$3a-2=0 \Rightarrow a = \frac{2}{3}$ ✓

$\alpha \cdot \beta = \frac{a}{1} \Rightarrow \alpha \cdot \beta = \frac{2}{3}$

$-1 \cdot \beta = \frac{2}{3}$

$\beta = -\frac{2}{3}$



$10-3a=0 \Rightarrow a = \frac{10}{3}$

$\alpha \cdot \beta = \frac{10}{3}$

$\alpha \cdot \beta = \frac{10}{3} \Rightarrow \alpha = \frac{5}{3}$

Q Find value of m for which both roots of Eqⁿ $x^2 - mx + 1 = 0$ are less than unity.

Profile 1

$$f(x) = x^2 - mx + 1$$

(1) $D \geq 0$
 $m^2 - 4 \geq 0$
 $m \leq -2$ or $m \geq 2$

(2) $\frac{-(-m)}{2} < 1$
 $m < 2$

(3) $f(1) > 0$
 $2 - m > 0$
 $m < 2$

$m \in (-\infty, -2] \cup [2, \infty)$

Q For what value of m both roots of Eqⁿ $x^2 - 6mx + 9m^2 - 2m + 2 = 0$ exceeds 3

Profile 1

$$f(x) = x^2 - 6mx + 9m^2 - 2m + 2$$

(1) $D \geq 0$
 $36m^2 - 4(9m^2 - 2m + 2) \geq 0$
 $8m - 8 \geq 0$
 $m \geq 1$

(2) $\frac{-(+6m)}{2} > 3$
 $m > 1$

(3) $f(3) > 0$

$9 - 18m + 9m^2 - 2m + 2 > 0$ $m < 1$ or $m > \frac{11}{9}$
 $9m^2 - 20m + 11 > 0 \Rightarrow (9m - 11)(m - 1) > 0$

$m \in \left(\frac{11}{9}, \infty\right)$

Q Find all values of P so that 6 lies between roots of Eqⁿ $x^2 + 2(P-3)x + 9 = 0$

Profile 1

$$f(x) = x^2 + 2(P-3)x + 9$$

$f(6) < 0$

$f(6) = 36 + 2(P-3)6 + 9 < 0$

$2P + 9 < 0$

$P < -\frac{9}{2}$

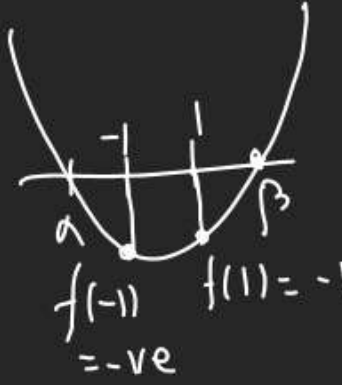
$P \in \left(-\infty, -\frac{9}{2}\right)$

II) Find value of a for which one root of Eqⁿ $ax^2 + 2x + 2a - 1 = 0$ is smaller than -1 & other gr. than 1 .

Profile 4

① $f(-1) < 0$
 $1 - \frac{2}{a} + \frac{2a-1}{a} < 0$
 $\frac{a-2+2a-1}{a} < 0$
 $\frac{3a-3}{a} < 0$

② $f(1) < 0$
 $1 + \frac{2}{a} + \frac{2a-1}{a} < 0$
 $\frac{a+2+2a-1}{a} < 0$
 $\frac{3a+1}{a} < 0$

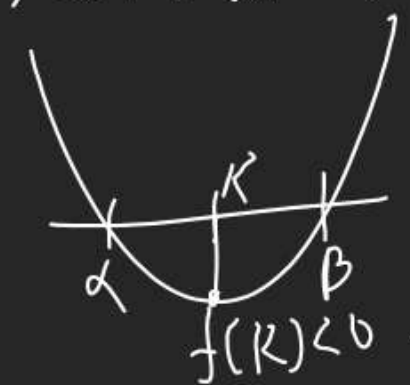


III) P.T. values of K for which $2x^2 - 2(2K+1)x + (K)(K+1) = 0$ has one root less than K & other gr. than K if $K > 0$ & $K < -1$

Profile 2

$f(x) = x^2 - (2K+1)x + \frac{(K)(K+1)}{2}$

$f(K) = K^2 - (2K+1)K + \frac{(K)(K+1)}{2} < 0$
 $= \frac{2K^2 - 4K^2 - 2K + K^2 + K}{2} < 0$
 $= \frac{-K^2 - K}{2} < 0$
 $-K^2 - K < 0$
 $(K)(K+1) > 0$



Q Find value of a for which roots of $x^2 - 2x + a^2 + 1 = 0$ lies betⁿ Roots of $x^2 - 2(a+1)x + a(a-1) = 0$

Pr 4

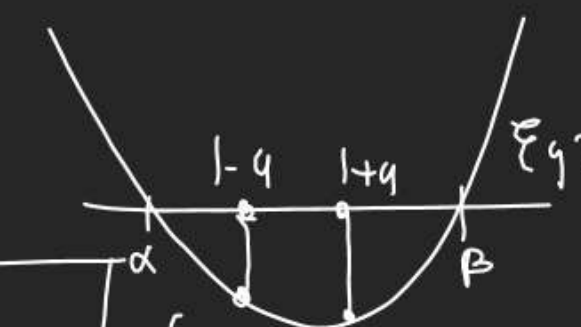
2 Q Eqⁿ den \rightarrow 1 Q Eqⁿ yst den Solvable den

$f(x) = x^2 - 2(a+1)x + a(a-1)$

$f(1-a) < 0$ $f(1+a) < 0$

Eq 1 $\rightarrow x^2 - 2x + a^2 + 1 = 0$

$(x-1)^2 - a^2 = 0$
 $(x-1-a)(x-1+a) = 0$
 $x = 1-a, 1+a$ Eq¹ Roots



$K < -1$ $K > 0$

$$f(1+a) < 0$$

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

$$a^2 + 2a + 1 - 2a^2 - 4a - 2 + a^2 - a < 0$$

$$-2a - 1 < 0 \Rightarrow -3a < 1$$

$$a > -\frac{1}{3}$$

$$f(-1) < 0$$

$$1 - \frac{2}{a} + \frac{2a-1}{a} < 0$$

$$\frac{a-2+2a-1}{a} < 0$$

$$\frac{3a-3}{a} < 0$$

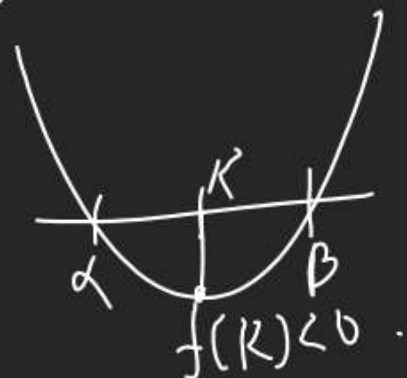
$$1 + \frac{2}{a} + \frac{2a-1}{a} < 0$$

$$\frac{a+2+2a-1}{a} < 0$$

$$\frac{3a+1}{a} < 0$$

III
ad²
Pro²
P.T. values of K for which $2x^2 - 2(2K)x$ has one Root less than K & other.

$$f(x) = x^2 - (2K+1)x + \frac{(K)(K+1)}{2}$$



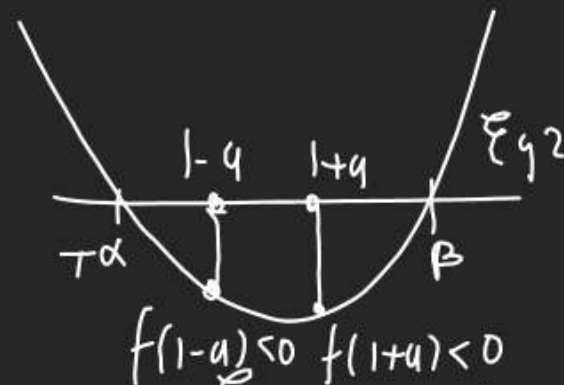
$$f(K) = K^2 - \frac{2K^2}{2}$$

Q Find value of a for which roots of

Pr⁴ $x^2 - 2x + a^2 + 1 = 0$ lies betⁿ Roots of

$$x^2 - 2(a+1)x + a(a-1) = 0$$

2 Q Eqⁿ den \rightarrow 1 Q Eqⁿ y² solve



$$f(x) = x^2 - 2(a+1)x + a(a-1)$$

$$f(1-a) < 0 \quad f(1+a) < 0$$

$$Eq 1 \rightarrow x^2 - 2x + a^2 + 1 = 0$$

$$f(1-a) = (1-a)^2 - 2(a+1)$$

$$f(1-a) < 0$$

$$x^2 - 2x + 1 - a^2 = 0$$

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

$$(x-1)^2 - (a)^2 = 0$$

$$1+a^2-2a-2+2a^2+a^2-a < 0$$

$$(x-1-a)(x-1+a) = 0$$

$$4a^2 - 3a - 1 < 0$$

$$4a - 4a + a - 1 < 0$$

$$(4a+1)(a-1) < 0$$

$$-\frac{1}{4} < a < 1$$

$x = 1-a, 1+a$ Eqⁿ Roots