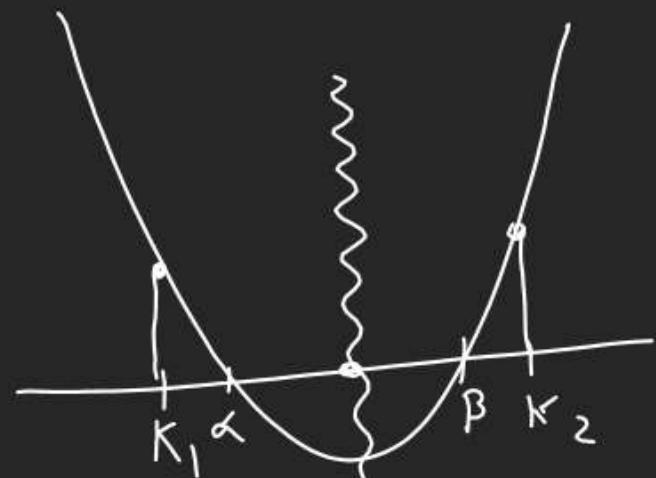


Profile 3 : Both Roots of $ax^2+bx+c=0$

are confined betw (K_1, K_2)
(const case)

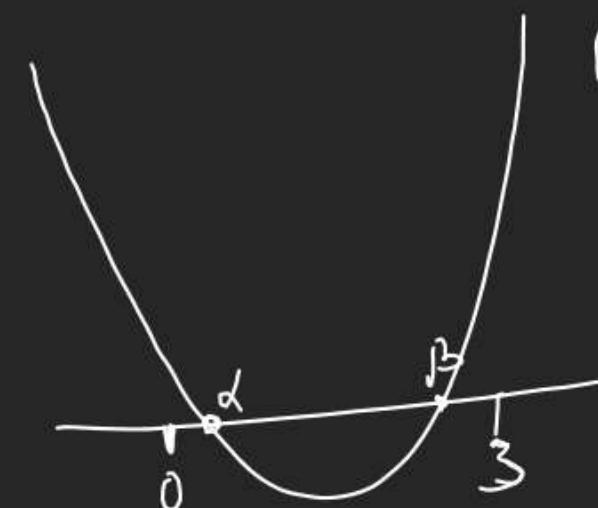


$$\textcircled{1} \quad D \geq 0 \quad \textcircled{2} \quad K_2 < -\frac{b}{2a} < K_1 \quad \textcircled{3} \quad f(K_1) > 0 \\ f(K_2) > 0$$

Below the graph, there is a wavy line representing a function. Below this line, the x-axis is marked with values: $-6, -\frac{11}{3}, -2\sqrt{2}, 0, 2\sqrt{2}, \frac{11}{3}$. The interval between $-2\sqrt{2}$ and $2\sqrt{2}$ is shaded.

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

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



$$\textcircled{1} \quad f(x) = x^2+ax+2$$

(A) $D \geq 0$

$$a^2 - 4x1x2 \geq 0$$

$$a^2 - 8 \geq 0$$

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

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

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

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

$$0 < -a < 6$$

$$0 > a > -6$$

(C) $f(0) > 0$

$$0^2 + ax + 2 > 0$$

$$2 > 0$$

(D) $f(3) > 0$

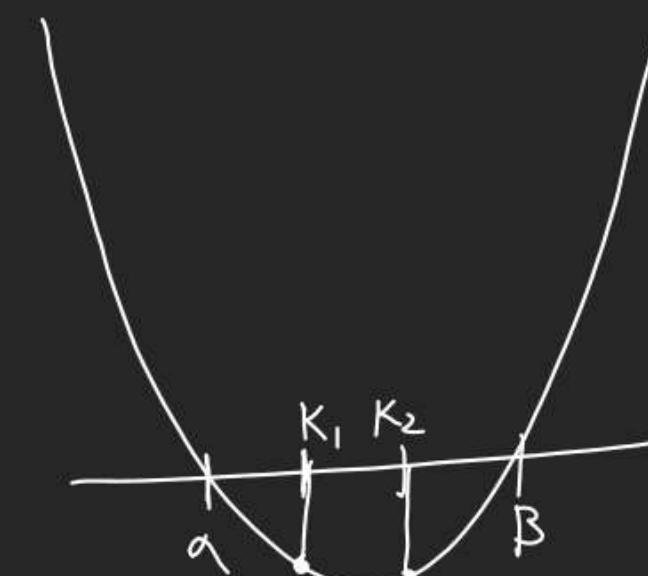
$$9 + 3a + 2 > 0$$

$$3a > -11$$

-3.66

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

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



only one condⁿ applicable

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

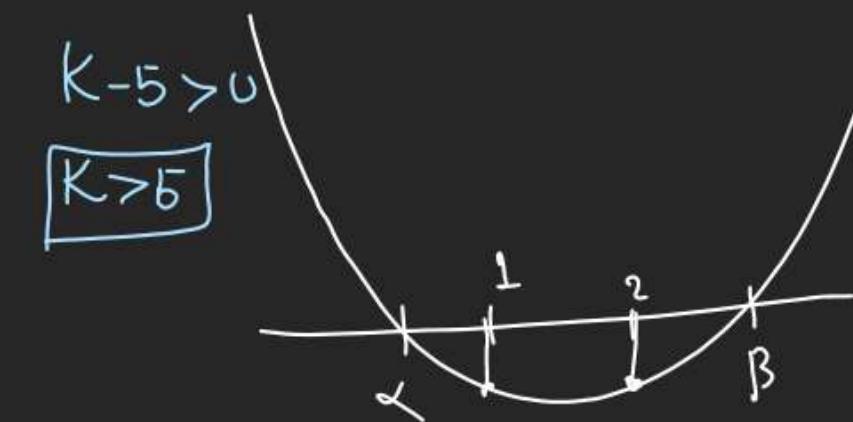
② Position of k_1, k_2 is not specified

$\Rightarrow -\frac{b}{2a}$ Condⁿ not Sure

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

Q Find all values of K for which one root of $(K-5)x^2 - 2Kx + K-4 = 0$ is smaller than 1 and other exceeds 2.

$$f(x) = x^2 - \frac{2K}{K-5}x + \frac{(K-4)}{(K-5)} \quad 5 < K < 24$$



1, 2 lies betⁿ Root

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

$$(1) f(1) < 0$$

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

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

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

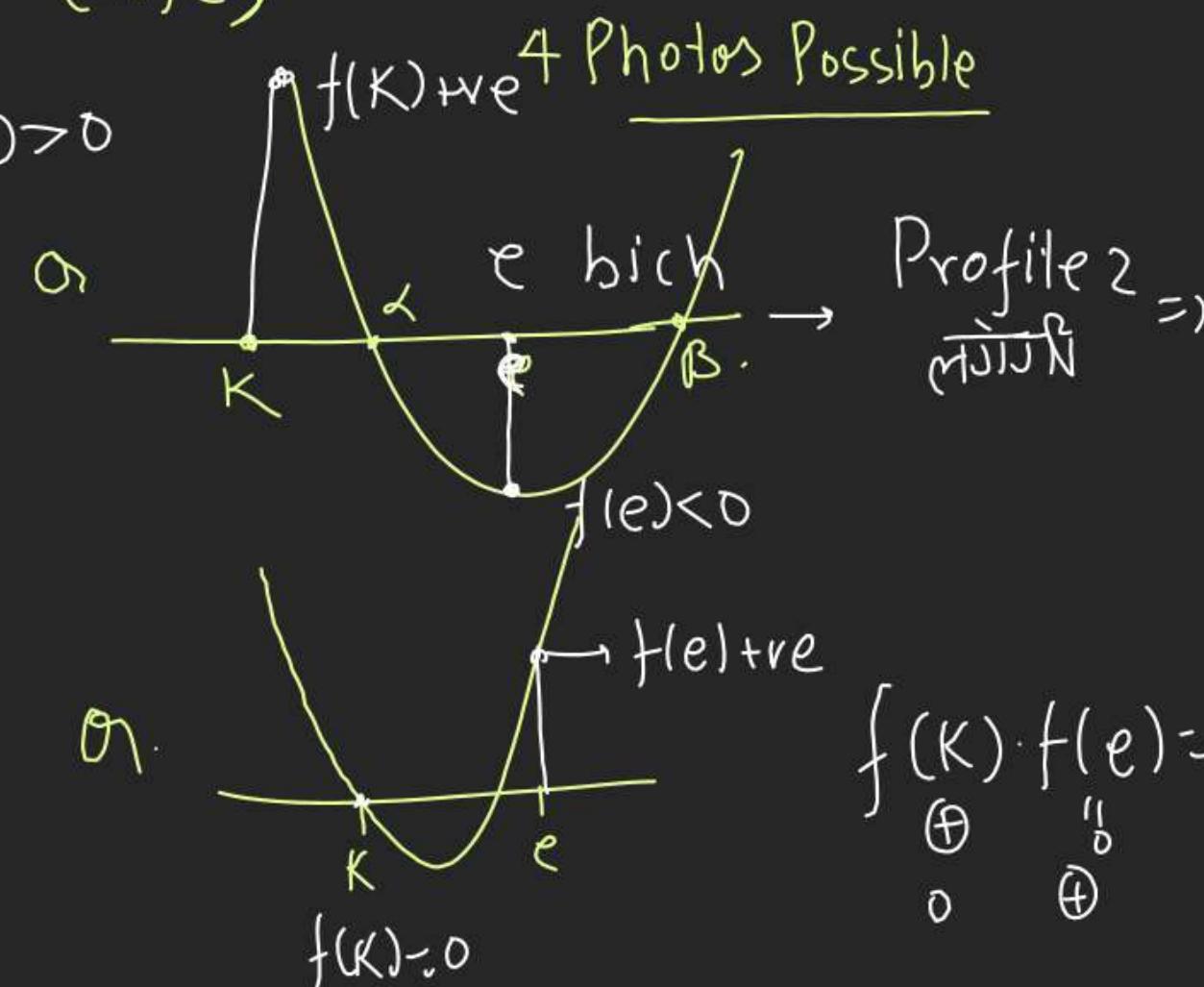
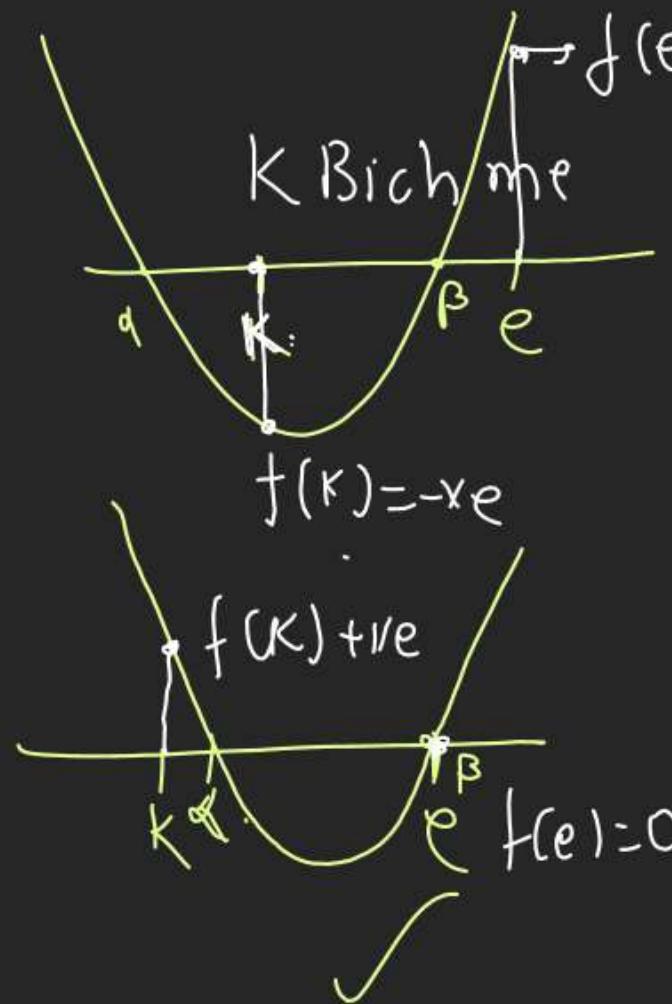
⊕ homu Parage

$$(2) f(2) < 0$$

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

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

Profiles :- When exactly one Root of Q.Eqn. lies bet'n (K, e)



$$\begin{cases} f(K) + ve & f(e) + ve \\ f(e) - ve & f(K) + ve \end{cases} \quad \boxed{f(K) \cdot f(e) < 0}$$

Cond'n (check Separately)

Q Find all values of a so that

Eq² $x^2 + (3-2a)x + a = 0$ has.

exactly one root in $(-1, 2)$.

Prop $f(x) = x^2 + (3-2a)x + a \leq 0$

① $f(-1) \cdot f(2) < 0$

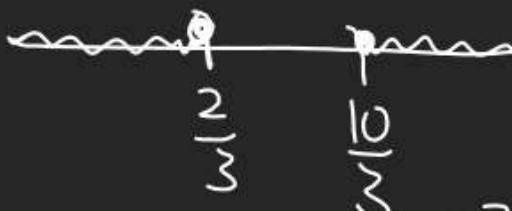
$$(1 + (3-2a)(-1) + a)(4 + 2(3-2a) + a) < 0$$

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

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

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

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



Checking 2nd(mdn)

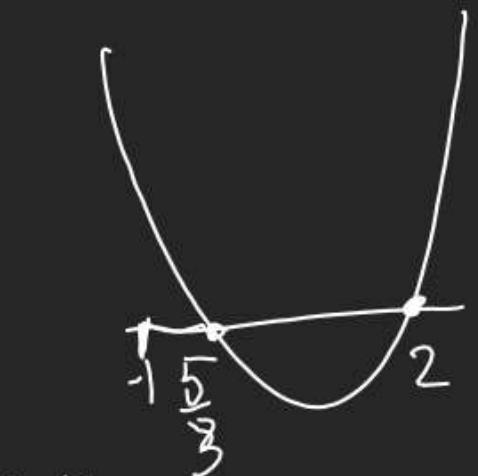
② $f(-1) = 0 \rightarrow$ one root at $x = -1$

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

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

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

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

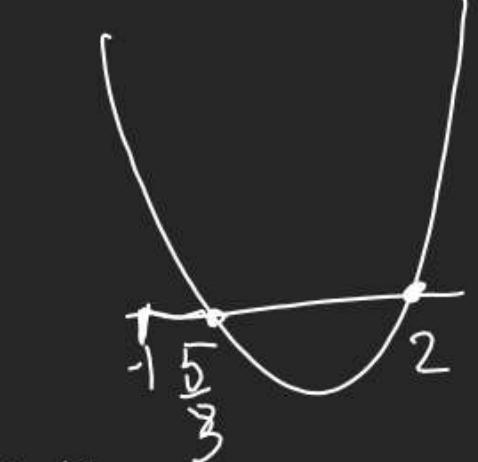


② $f(2) = 0 \rightarrow \beta = 2$

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

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

$$\alpha \cdot 2 = \frac{10}{3} \Rightarrow \alpha = \frac{5}{3}$$



$(-1, 2)$



Q Find value of m for which both Roots
of eqn $x^2 - mx + 1 = 0$ are less than Unity.

$$f(x) = x^2 - mx + 1 \quad | \quad \begin{array}{l} \textcircled{1} \quad D \geq 0 \\ \textcircled{2} \quad \frac{-(-m)}{2} < 1 \\ \textcircled{3} \quad f(1) > 0 \end{array}$$

$$\begin{aligned} m^2 - 4 &\geq 0 \\ m &\leq -2 \cup m \geq 2 \end{aligned} \quad \left. \begin{array}{l} m < 2 \\ m \in (-\infty, 2] \end{array} \right| \quad \begin{array}{l} 2 - m > 0 \\ m < 2 \end{array}$$

Q For what value of m both Roots of eqn

Profile $x^2 - 6mx + 9m^2 - 2m + 2 = 0$ exceeds 3

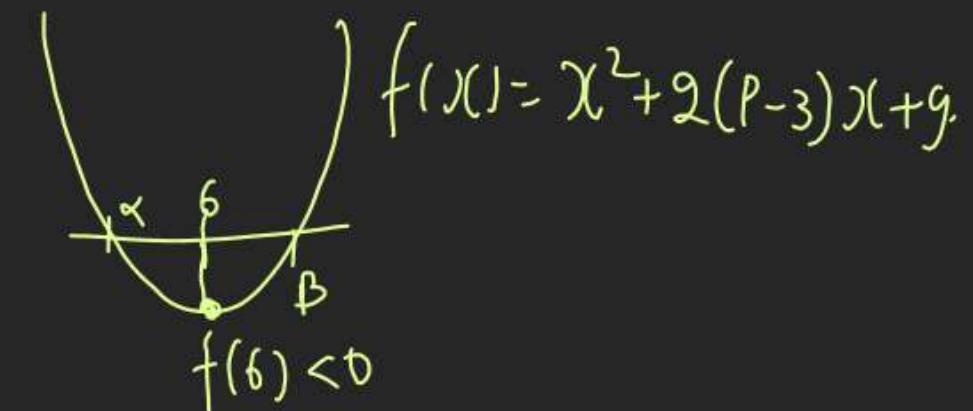
$$\begin{aligned} & \left. \begin{array}{l} \textcircled{1} \quad D \geq 0 \\ 36m^2 - 4(9m^2 - 2m + 2) \geq 0 \\ 8m - 8 \geq 0 \end{array} \right| \quad \boxed{m \geq 1} \\ & \textcircled{2} \quad \frac{-(+6m)}{2} > 3 \\ & \boxed{m > 1} \\ & \textcircled{3} \quad f(3) > 0 \end{aligned}$$

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

$$\begin{aligned} 9 - 18m + 9m^2 - 2m + 2 &> 0 \quad m < 1 \cup m > \frac{11}{9} \\ 9m^2 - 20m + 11 &> 0 \Rightarrow (9m - 11)(m - 1) > 0 \end{aligned}$$

Q Find all values of P so that 6 lies

Profile b in Roots of eqn $x^2 + 2(P-3)x + 9 = 0$



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

$$2P + 9 < 0$$

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

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

Q Find value of a for which one root

of eqn $a)x^2 + 2x + 2a - 1 = 0$ is smaller than -1 & other gr. than 1 .

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

$$\text{① } f(-1) < 0$$

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

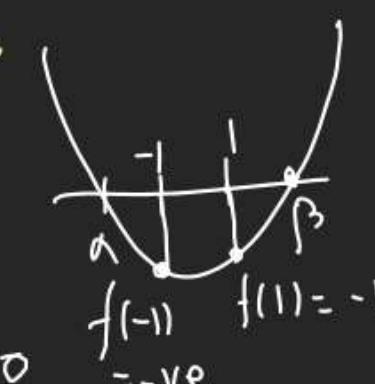
$$\frac{a-2+2a-1}{a} <$$

$$3 - 3 < 0$$

$$\text{② } f(1) < 0$$

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

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



Q Find value of a for which roots of

$$x^2 - 2x + a^2 + 1 = 0$$
 lies b/w Roots of

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

2 Q Eqn \rightarrow Solvable

Solvable

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

$$\begin{cases} f(1-a) \\ f(1+a) \end{cases}$$

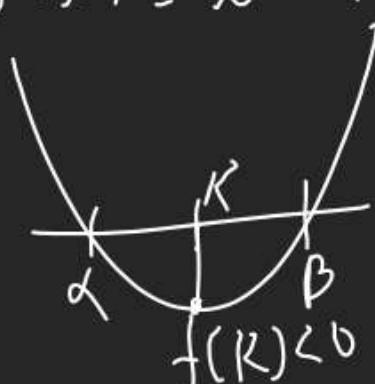
$$= (1-a)^2 - 2(a+1)$$

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

$$\begin{aligned} (1-a)^2 - (a)^2 - 2a - 2 &= 0 \\ (1-a)(1+a) - 2a - 2 &= 0 \\ (1-a)(1+a) - 2a - 2 &= 0 \end{aligned}$$

$$x = 1-a, 1+a \text{ Eqn Roots}$$

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



$$f(K) = K^2 - (2K+1)K + (K)(K+1) < 0$$

$$= \frac{2K^2 - 4K^2 - 2K + K^2 + K^2}{2} < 0$$

$$-K^2 - K < 0$$

$$(K)(K+1) > 0 \quad \boxed{K < 0 \cup K > 1}$$

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

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

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

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

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

$$\text{① } f(-1) < 0$$

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

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

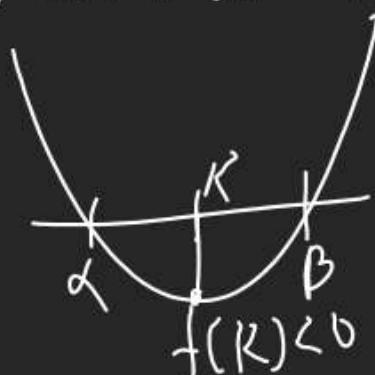
$$\frac{3a-3}{a} < 0$$

Ques

P.T. values of K for which $2x^2 - 2(2K+1)x + (K)(K+1) < 0$

Prove has one Root less than K & other.

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



$$f(K) = K^2 -$$

$$= 2K^2$$

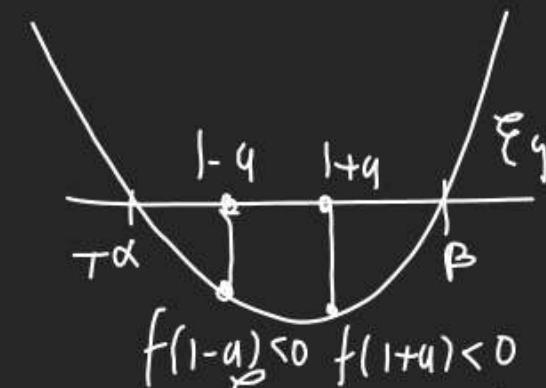
Q Find value of a for which roots of

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

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

2 Q Eqn 7 का \rightarrow 1 Q Eqn 7 का दर्शक

Solvable (दर्शक)



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

$$\text{Eq 1} \rightarrow x^2 - 2x - a^2 + 1 = 0 \quad \left| \begin{array}{l} f(1-a) \\ f(1+a) \end{array} \right. \quad \left| \begin{array}{l} f(1-a) \\ f(1+a) \end{array} \right. \quad \left| \begin{array}{l} f(1-a) \\ f(1+a) \end{array} \right. \\ = (1-a)^2 - 2(a+1) - a^2 + 1 = 0$$

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

$$(1-a)^2 - 2(1+a)(1-a) + a(a-1) < 0 \quad \left| \begin{array}{l} (1-a)^2 - (a)^2 = 0 \end{array} \right. \quad \left| \begin{array}{l} (1-a)^2 - (a)^2 = 0 \end{array} \right. \\ (1-a)^2 - 2a^2 + 2a^2 - a^2 - a < 0$$

$$(1-a)^2 - a^2 - a < 0 \quad \left| \begin{array}{l} (x-1-a)(x-1+a) = 0 \end{array} \right. \quad \left| \begin{array}{l} (x-1-a)(x-1+a) = 0 \end{array} \right. \\ 4a^2 - 3a - 1 < 0$$

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

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

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

$x = 1-a, 1+a$ Eqn 7 के Roots