Nishant Jindal

QUADRATIC EQUATION

Q Find Linear factors of

$$x^2-3xy+2y^2-2x-3y-35=0$$

$\longrightarrow$ Q in y

M2

$$2y^2-y(3x+3)+(x^2-2x-35)=0$$

$$y=\frac{+(3x+3)\pm\sqrt{(3x+3)^2-4\times 2(x^2-2x-35)}}{4}$$

$$y=\frac{(3x+3)\pm\sqrt{9x^2+9+18x-8x^2+16x+280}}{4}$$

$$y=\frac{(3x+3)\pm\sqrt{x^2+34x+289}}{4} \Rightarrow y=\frac{(3x+3)\pm\sqrt{(x+17)^2}}{4}$$

(+)

$$y=\frac{(3x+3)+(x+17)}{4}=x+5 \Rightarrow \boxed{y=x+5}$$

$$(x-y+5)=0$$

(−)

$$y=\frac{(3x+3)-(x+17)}{4}=\frac{x}{2}-\frac{7}{2}$$

$$\Rightarrow \boxed{2y=x-7}$$

$$(x-2y-7)=0$$

$$(x-y+5)(x-2y-7)=0$$

QUADRATIC EQUATION

Silent Learning

$$f(x,y) = ax^2+by^2+2hxy+2gx+2fy+c=0$$

$$by^2 + y(2hx+2f) + (ax^2+2gx+c) = 0$$

$$y = \frac{-(2hx+2f) \pm \sqrt{\{(2hx+2f)^2-4b(ax^2+2gx+c)\}}}{2b}$$

If $f(x,y)$ in Reducible in Linear factor.

$$\{(2hx+2f)^2 - 4b(ax^2+2gx+c)\} =$$

Should be a Per sq^r.

$\boxed{D=0} \Rightarrow D = \begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0$

$$\left|\begin{array}{ccc|cc} a & h & g & a & h \\ h & b & f & h & b \\ g & f & c & g & f \end{array}\right.$$

$$D = (abc+2fgh) - (bg^2+af^2+ch^2)$$

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QUADRATIC EQUATION

LOR

Location of Root

1) We have mainly 5 Profiles.
2) We should Rem. every Profile

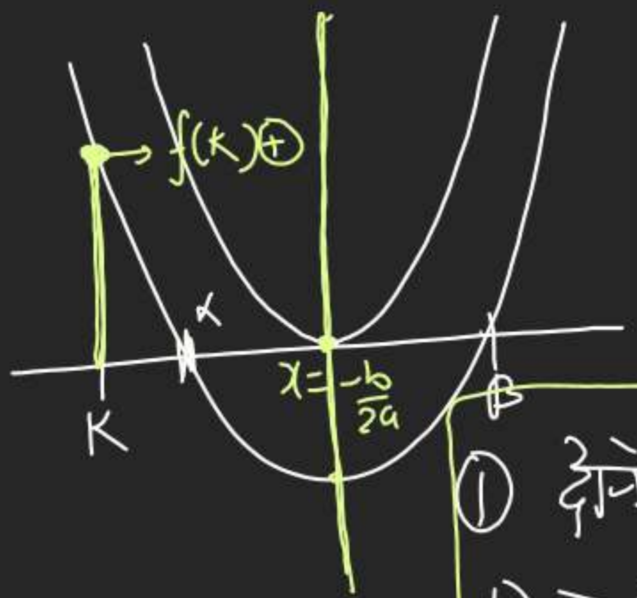
Profile 1

If both Roots of $ax^2+bx+c=0$ are gr. than a Const. "K"

① $x^2+\frac{b}{a}x+\frac{c}{a}=0$ (Reduce)

② $f(x)=1.x^2+\frac{b}{a}x+\frac{c}{a}$ (Corresponding fxn)

③ Diagram



① दोनों Roots हैं $D\geq 0$	② $-\frac{b}{2a}>K$	③ $f(K)>0$

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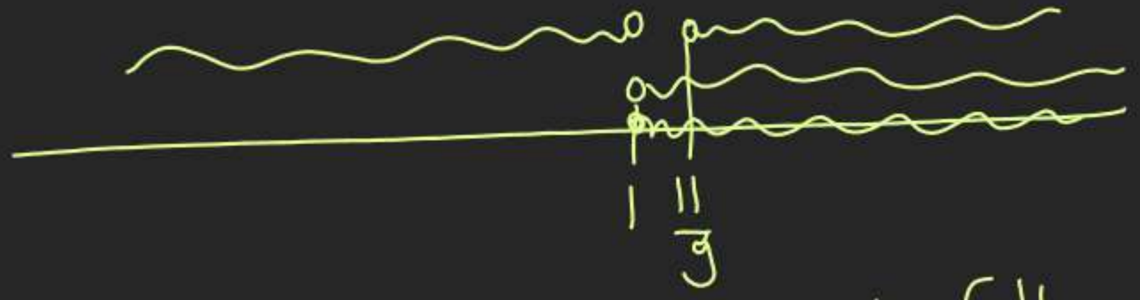
Cond^n Hamesha 3 chijo pr Lgani
1) $D \geq 0$ ...
2) Line of Sym. 3) $f(k)$

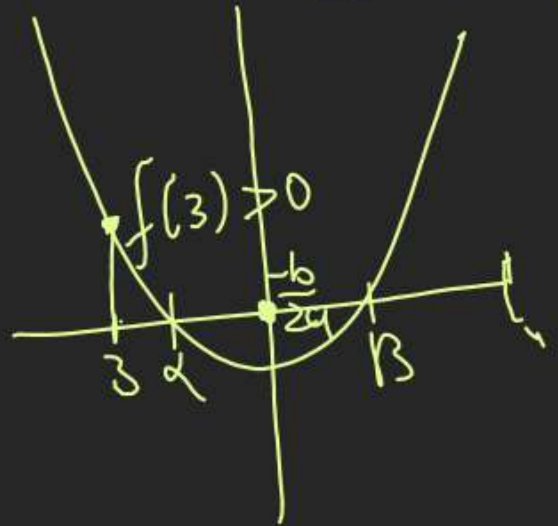


$d \in \left(\frac{11}{9}, \infty\right)$

Q Find $\underline{k}$ for which both Roots of eq^n.
$x^2 - 6dx + (2 - 2d + 9d^2) = 0$ 1) Exceed 3 2) less than 3.

Corres fxn 1) $f(x) = x^2 - 6dx + (2 - 2d + 9d^2)$

2) diag



A) $D \geq 0$

$(-6d)^2 - 4 \times 1 \times (2 - 2d + 9d^2) \geq 0$

$\cancel{36d^2} - 8 + 8d - \cancel{36d^2} \geq 0$

$8d \geq 8$

$d \geq 1$

B) $-\frac{b}{2a} > 3$

$+\frac{(+6d)}{2 \cdot 1} > 3$

$\boxed{d > 1}$

3) $f(3) > 0$

$3^2 - 18d + (2 - 2d + 9d^2) > 0$

$9d^2 - 20d + 11 > 0$

$9d^2 - 9d - 11d + 11 > 0$

$9d(d-1) - 11(d-1) > 0$

$(9d - 11)(d-1) > 0$

$d < 1 \cup d > \frac{11}{9}$

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QUADRATIC EQUATION (Adv.)

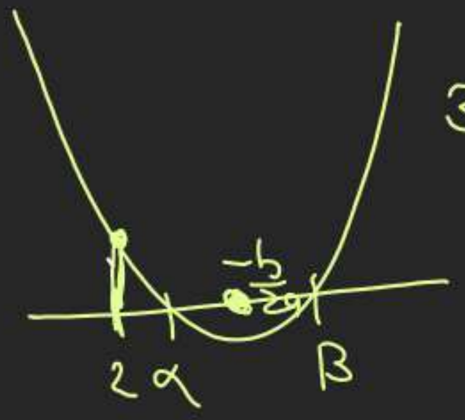
Q Find K for which Roots of $(K-1)x^2+2Kx+3=0$ are gr. than 2.

1) Eqⁿ → $(K-1)x^2+2Kx+3=0$

$\Rightarrow x^2+\frac{2K}{K-1}x+\frac{3}{K-1}=0$

2) $f(x)=x^2+\frac{2K}{K-1}x+\frac{3}{K-1}$

3) diag $K=\frac{3\pm\sqrt{9-4\times1\times3}}{2}$



$\frac{1}{8}$, $\frac{2}{3}$, 1 $K\in\phi$

A) $D\geq 0$

$\left(\frac{2K}{K-1}\right)^2-4\cdot1\cdot\frac{3}{(K-1)}\geq 0$

$\frac{4K^2-12(K-1)}{(K-1)^2}\geq 0$

$\frac{(K^2-3K+3)}{(K-1)^2}\geq 0$ $D<0$

(+)ve $K\in R$

② $-\frac{b}{2a}>2$

$\frac{-\left(\frac{2K}{K-1}\right)}{2\times1}>2$

$\frac{2K}{2(1-K)}>2\cdot1$

$\frac{K}{2(1-K)}-1>0$

$\frac{K-2+2K}{2(1-K)}>0$

$\frac{(3K-2)}{2(K-1)}<0$

+ − + ; $\frac{2}{3}$, 1

③ $f(2)>0$

$4+\frac{4K}{K-1}+\frac{3}{K-1}>0$

$\frac{4K-4+4K+3}{(K-1)}>0$

$\frac{8K-1}{(K-1)}>0$

+ − + ; $\frac{1}{8}$, 1

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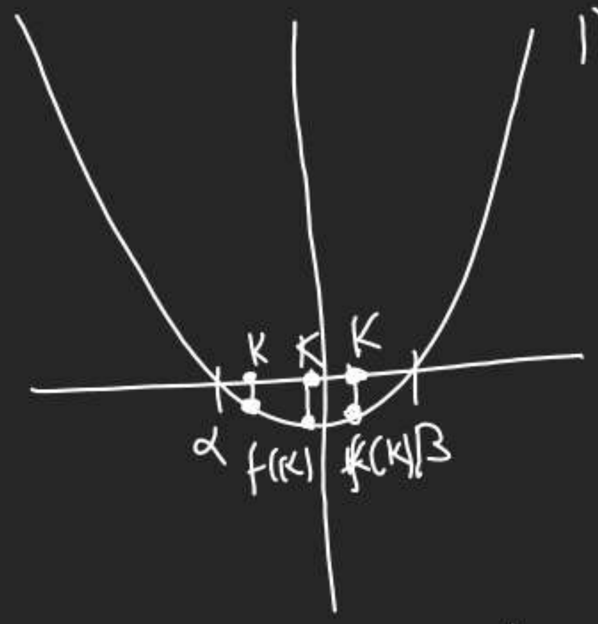
QUADRATIC EQUATION

Profile 2

When Both Roots lies opp sides of Const. K.



1) Bich me Kahin Pr bhi K ho Sakta hai

2) α, β are already there.

① $D \geq 0$ We will not Check

(3) line of Symm. can not be Justified.

$-\frac{b}{2a}$ vali Cond^n ⊗

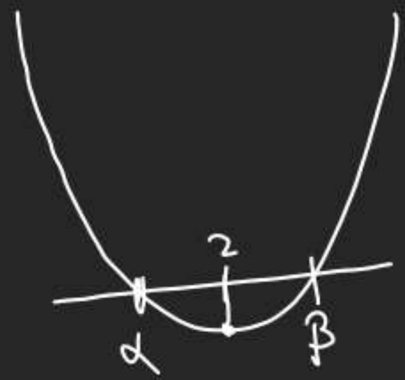
(4) $f(K) < 0$ [Only one Cond^n Required]

Q Find K for which Roots of Eqn.

$x^2-(K+1)x+(K^2+K-8)=0$ are either side of 2.

① $D \geq 0$ ✗ ② $\frac{-b}{2a}$ ⊗

③ $f(2) < 0$



$f(x) = x^2-(K+1)x+(K^2+K-8)$

$f(2) = 4-2(K+1)+K^2+K-8 < 0$

$K^2-K-6 < 0$

$(K-3)(K+2) < 0$

$-2 < K < 3$

$\therefore K \in (-2, 3)$

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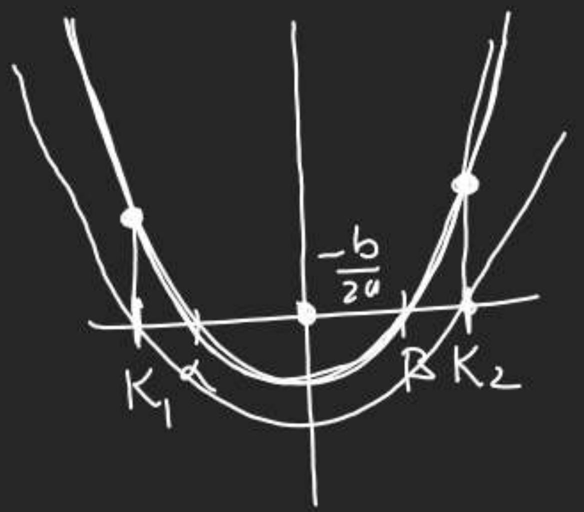
QUADRATIC EQUATION

Profile 3

When Both Roots are confined betn 2 constant

$[K_1, K_2]$



① $D \geq 0$ ✓

② $K_1 \leq \frac{-b}{2a} \leq K_2$

(3) $f(K_1) \geq 0$ & $f(K_2) \geq 0$

Ex 2

13, 14, 15, 16, 17, 18	20, 21	$\boxed{25, 26}$	27
Ineq. $D<0$	Com.	Range	L.F.

28 → Q in x → $D \geq 0$
Q in y → $D \geq 0$

29 | LOR ㉙ Pro 2
30 | ㉚ Pro 3