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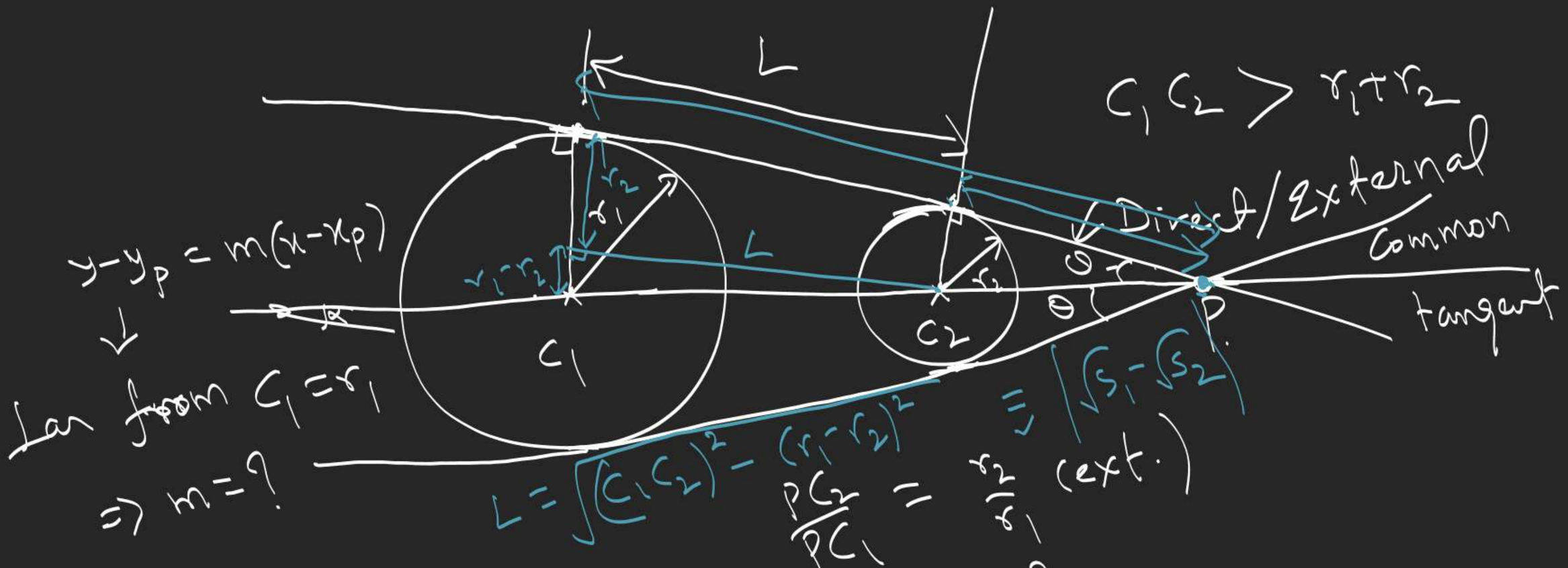
Common Tangents to 2 circles



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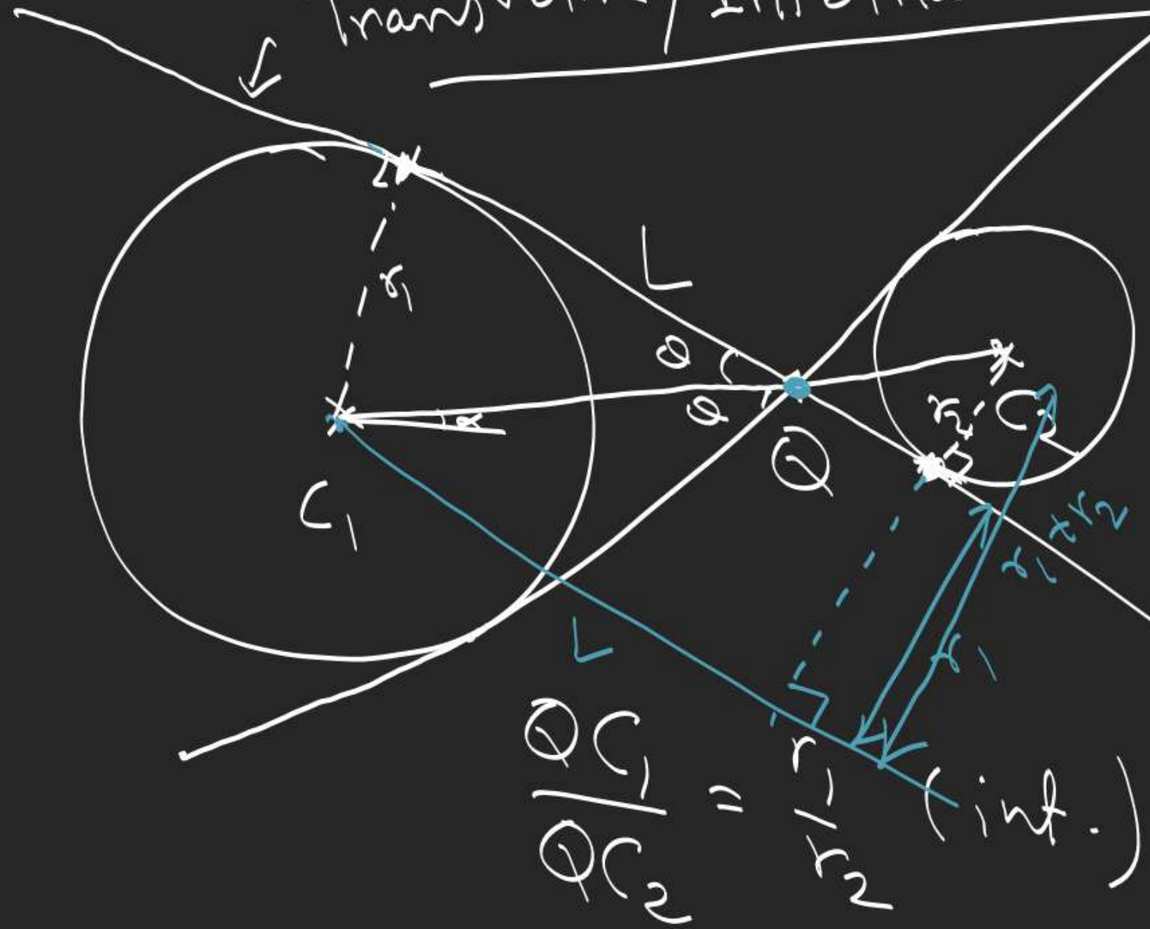
Transverse / Internal Common Tangent



$$\frac{QC_1}{QC_2} = \frac{r_1}{r_2}$$

$$m = \tan(\alpha \pm \theta)$$

$Q = ?$

$y - y_Q = m(x - x_Q)$

Tan from $C_2 = r_2$

$m = ?$

$$L = \sqrt{(C_1C_2)^2 - (r_1+r_2)^2}$$

$$= \sqrt{S_1} + \sqrt{S_2}$$

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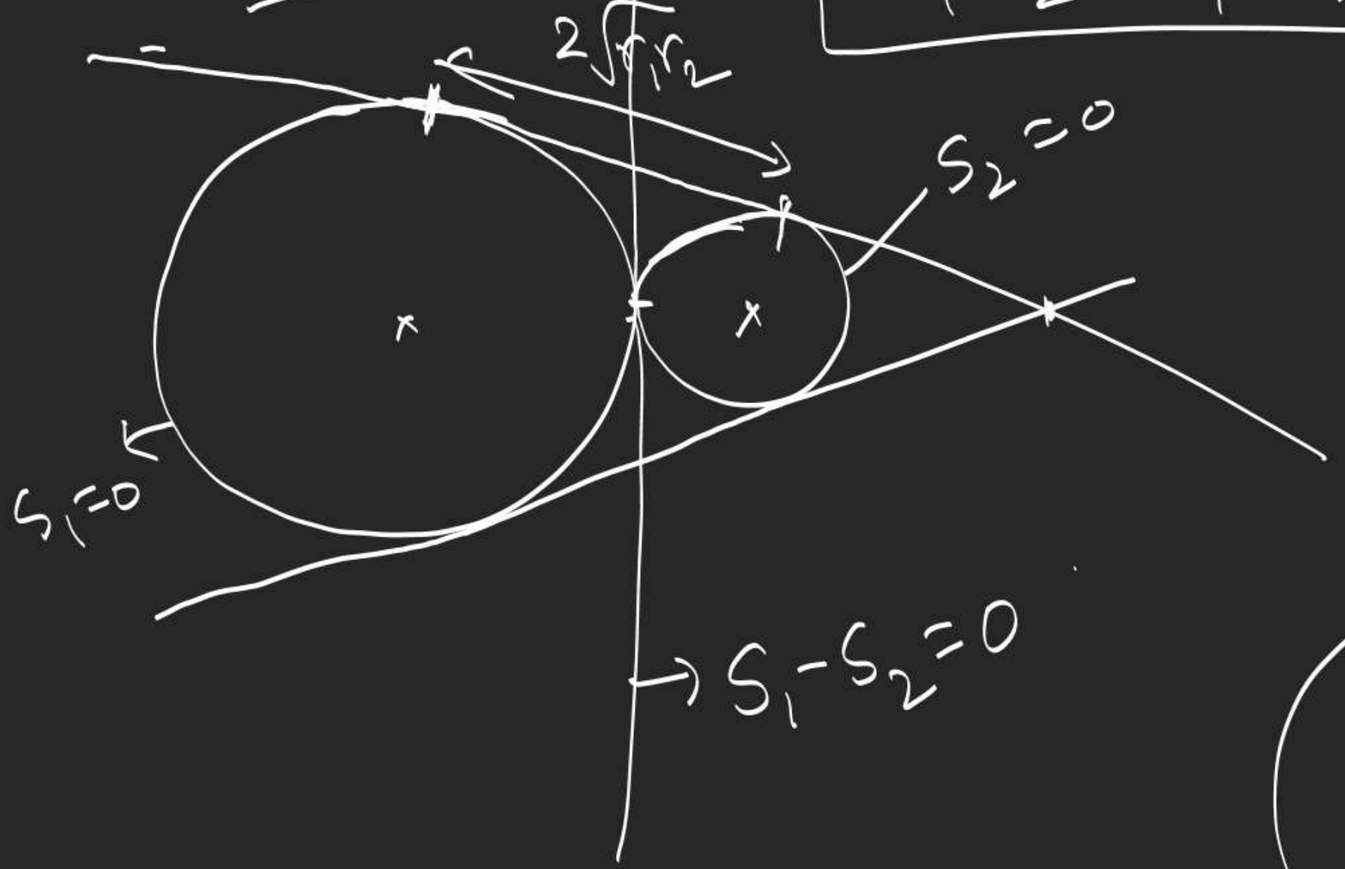
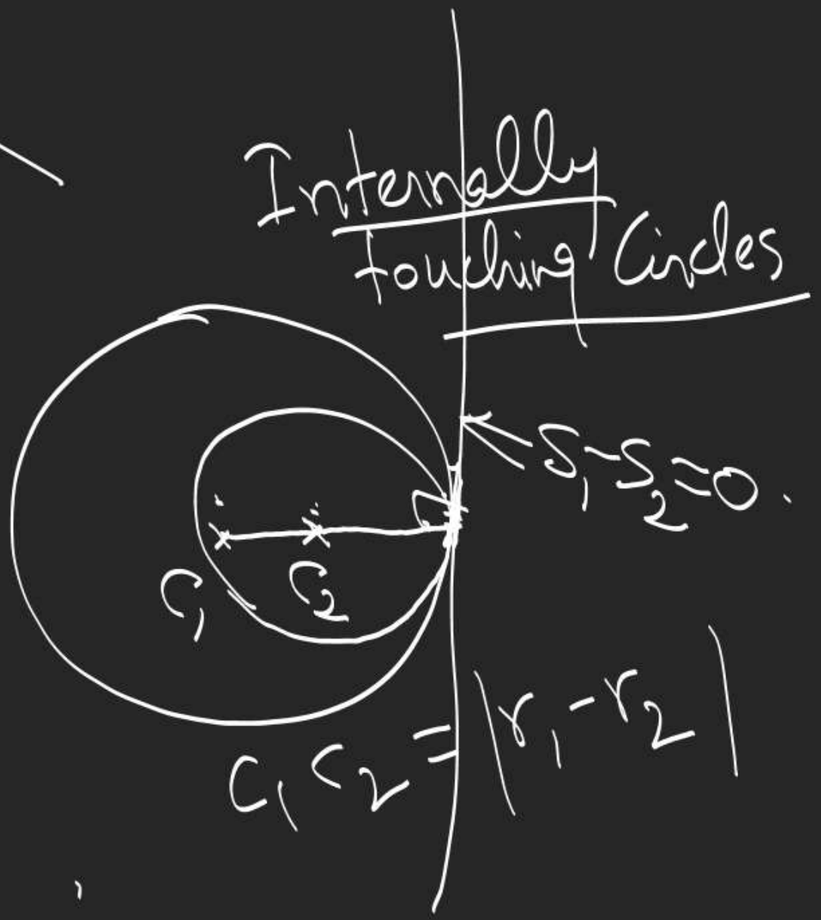
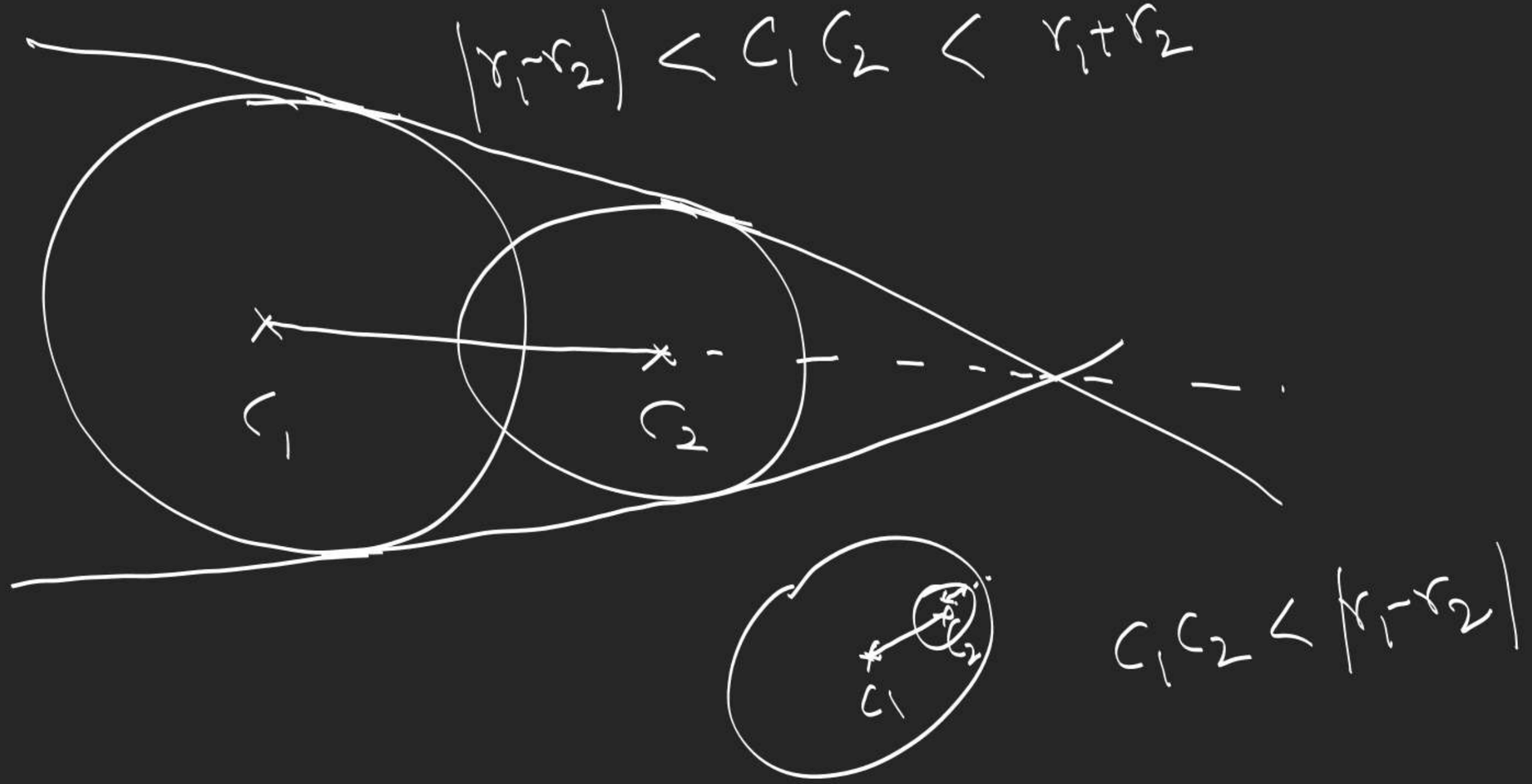
Externally touching circles

$C_1C_2 = r_1 + r_2$



Internally Touching Circles





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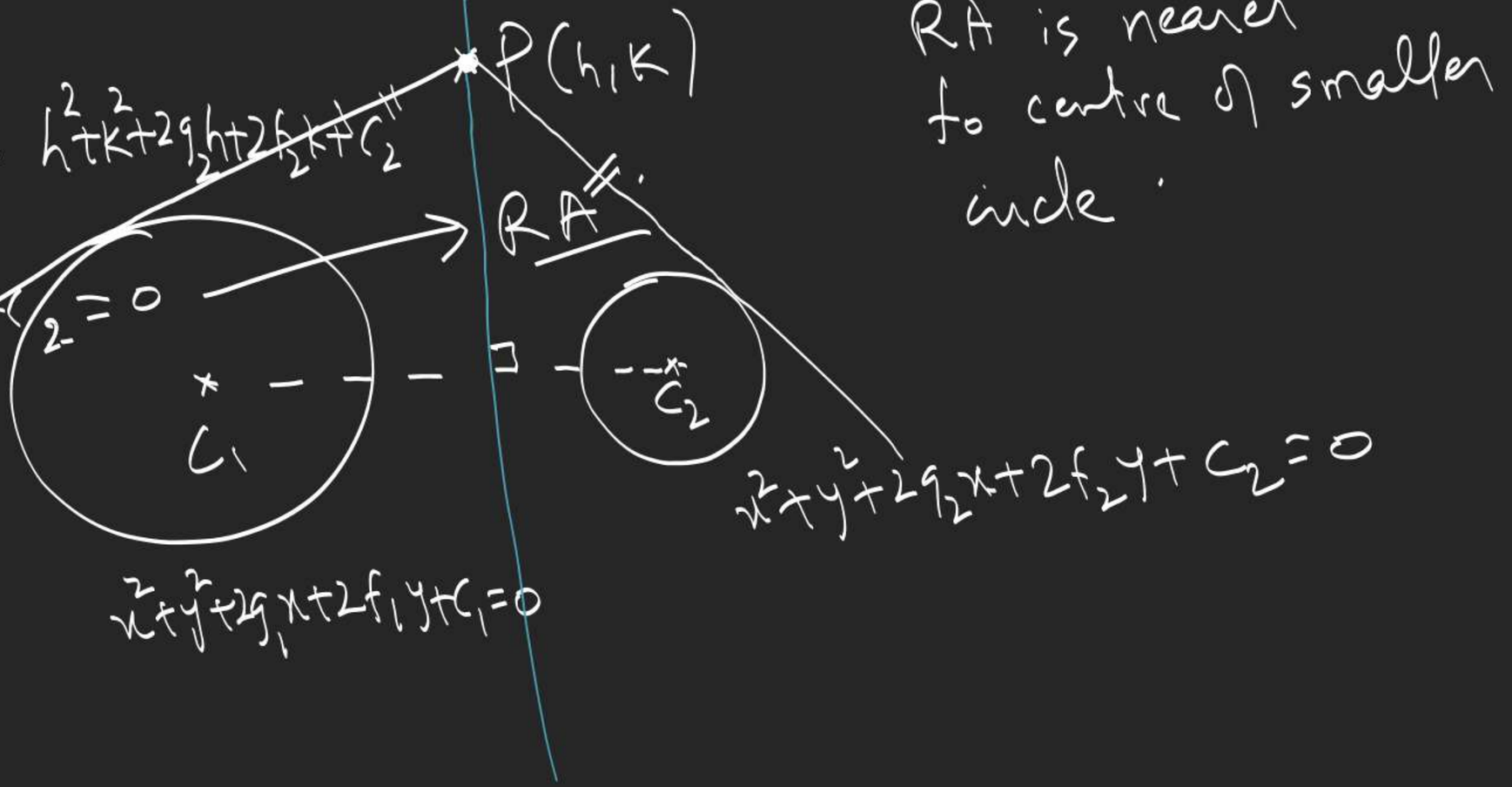
Radical Axis of 2 circles



$h^2+k^2+2g_1h+2f_1k+c_1 = h^2+k^2+2g_2h+2f_2k+c_2$

$2(g_1-g_2)x+2(f_1-f_2)y+c_1-c_2=0$

RA is nearer to centre of smaller circle.

$x^2+y^2+2g_1x+2f_1y+c_1=0$

$x^2+y^2+2g_2x+2f_2y+c_2=0$

RA → $\boxed{S_1-S_2=0}$

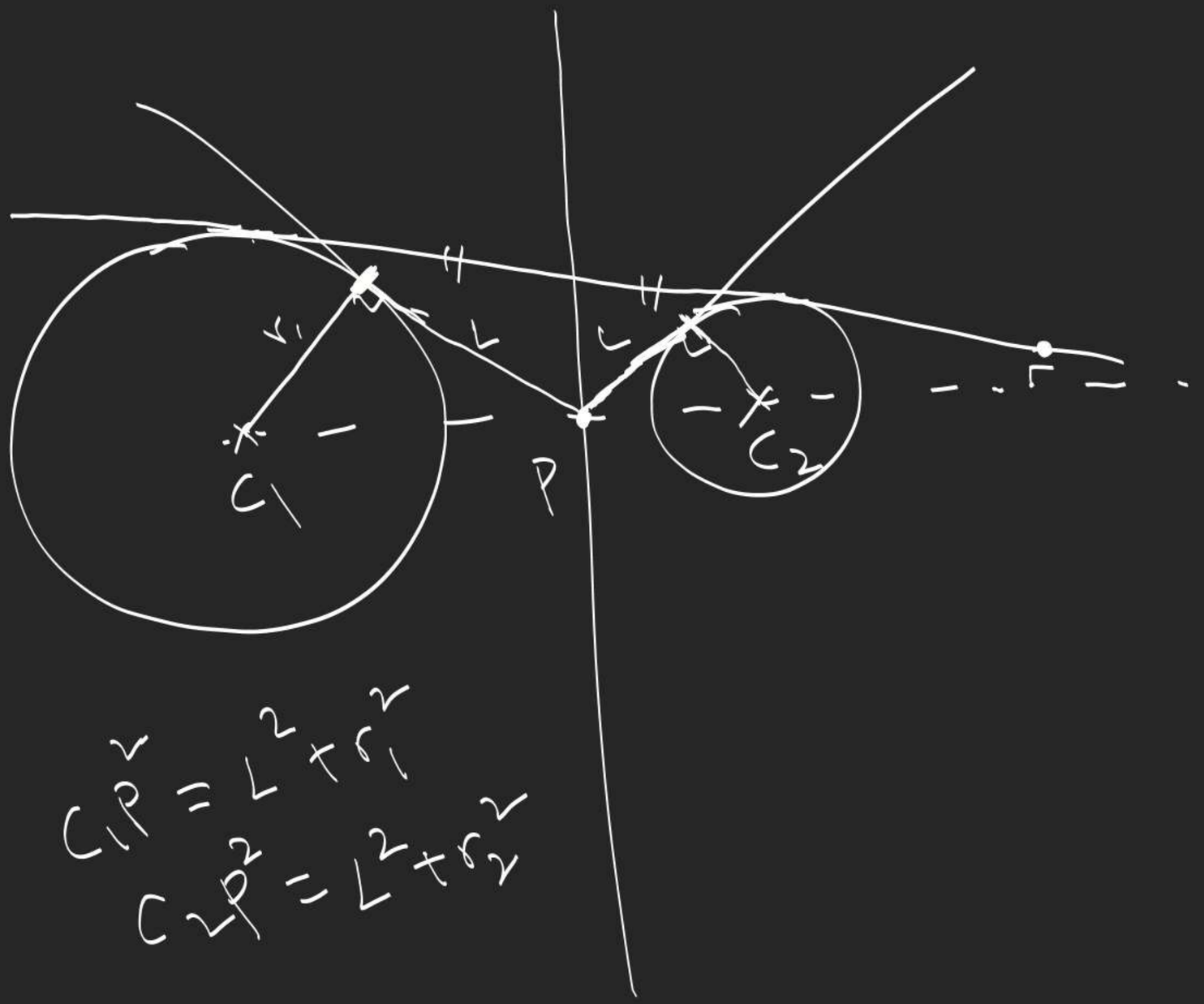
Note →

1.

2.

3.

4.



$$C_1P^2 = L^2 + r_1^2$$

$$C_2P^2 = L^2 + r_2^2$$

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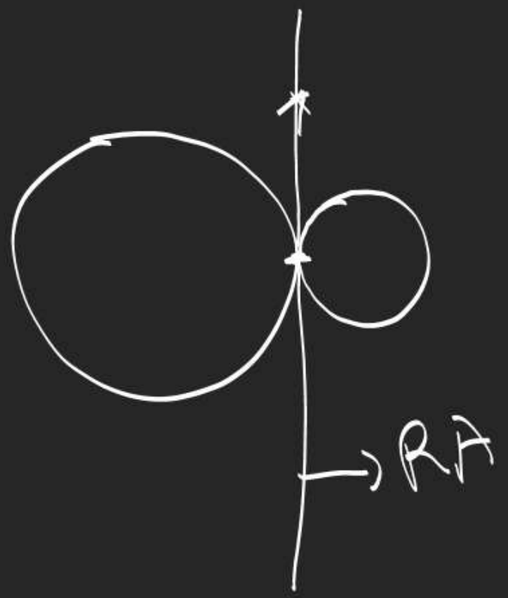

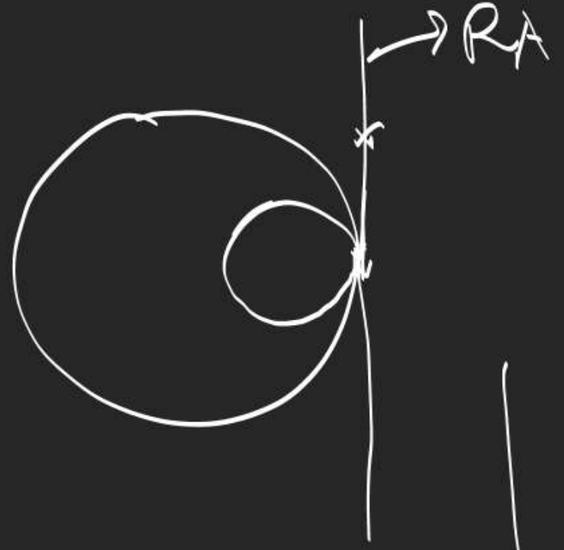

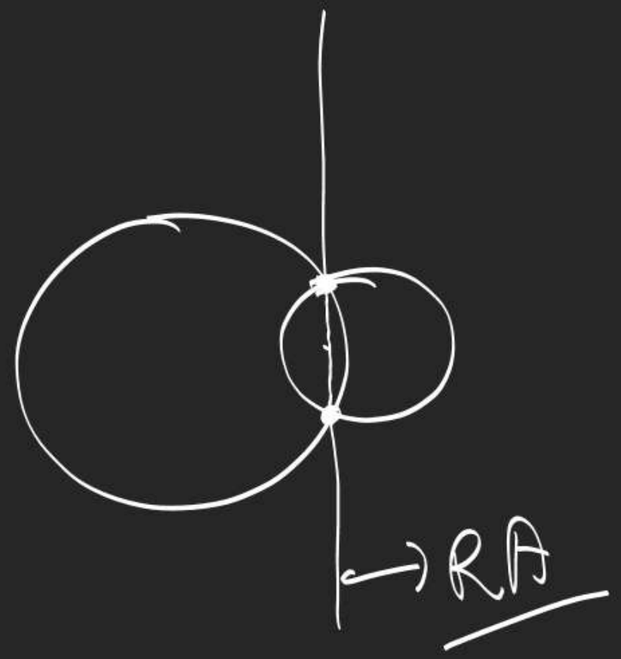

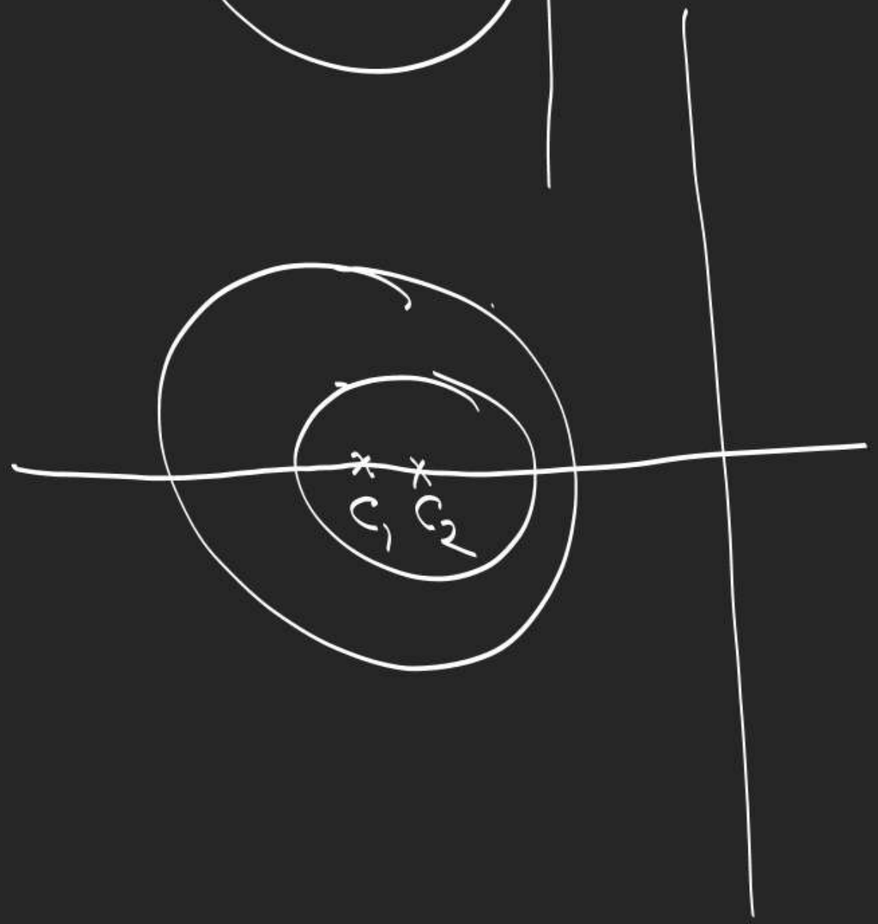

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$A(\alpha,\alpha)$ — $C(1,0)$

$B(\beta,2\beta)$

$(0,-1)$ — $C(\gamma,3\gamma+1)$

$$\frac{\alpha-0}{\alpha-1}=\frac{2\beta-0}{\beta-1} \Rightarrow -\alpha=\cdot$$

$$\alpha\beta-\alpha=2\alpha\beta-2\beta$$

$$2\beta=\alpha\beta+\alpha$$

$$\alpha=\frac{2\beta}{\beta+1}$$

AC $\rightarrow x-1+\beta L_2=0$

Ex-1 (1-15)

$$\frac{2\beta+1}{\beta}=\frac{3\gamma+1}{\gamma}$$

$$\frac{2\beta+1}{\beta}-3=\frac{1}{\gamma}=\frac{1-\beta}{\beta}$$

$$\gamma=\frac{\beta}{1-\beta}$$