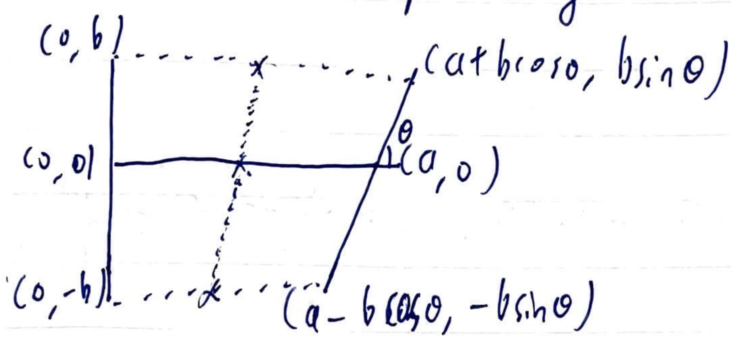
Prove

Q: For two arbitrary lines of same length, midpoints between them are concurrent.

without loss of generality, let



midpoints : $\left(\frac{a-b\cos\theta}{2}, \frac{-b-b\sin\theta}{2}\right)$, $\left(\frac{a}{2}, 0\right)$, $\left(\frac{a+b\cos\theta}{2}, \frac{b+b\sin\theta}{2}\right)$

P_1 P_2 P_3

line eq: $y - \alpha_1 = m(x - \beta_1)$

$\cancel{y - \alpha_1}$ $y - y_{P_1} = \frac{y_{P_3} - y_{P_1}}{x_{P_3} - x_{P_1}}(x - x_{P_1})$

$$y + \frac{b+b\sin\theta}{2} = \frac{b+b\sin\theta}{b\cos\theta}\left(x - \frac{a-b\cos\theta}{2}\right)$$

subs in $\left(\frac{a}{2}, 0\right)$

L.H.S $= \frac{b+b\sin\theta}{2}$ R.H.S $= \frac{b+b\sin\theta}{b\cos\theta}\left(\frac{a}{2} - \frac{a-b\cos\theta}{2}\right)$

$= \frac{b+b\sin\theta}{2}$

$\therefore$ L.H.S = R.H.S //