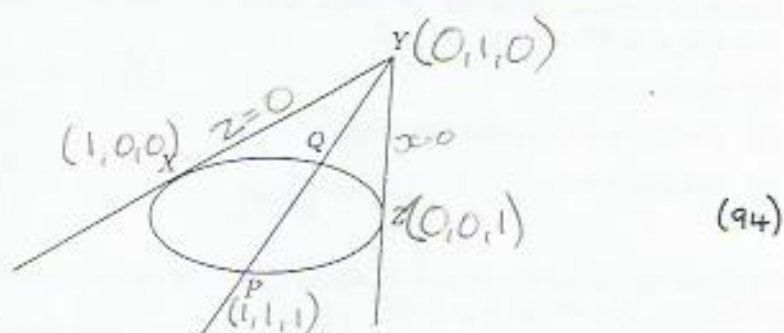


36

The figure below shows a conic in standard form in \mathbb{RP}^2 , where the Points $X[1, 0, 0]$, $Z[0, 0, 1]$ and $P[1, 1, 1]$ lie on the conic and the tangents at X and Z meet at $Y[0, 1, 0]$. The Point Q is where the Line PY cuts the conic again.

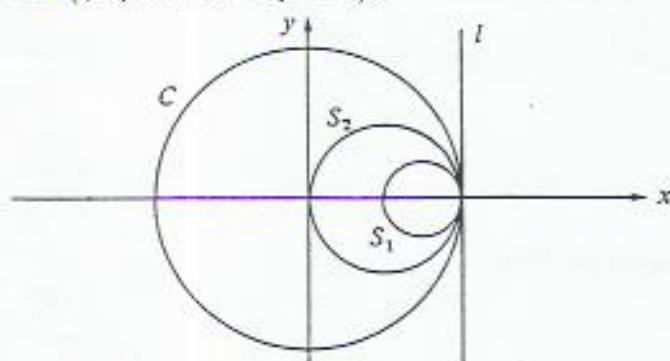


- (a) What is the equation of the conic? $xy + xz + yz = 0$
 (b) Find the equation of the Line PY . $x = z$
 (c) Find the Point Q where the Line PY cuts the conic again. [5]

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This question concerns inversion in the unit circle

$$C = \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 = 1\}.$$



S_1 is the circle (centre $(\frac{1}{2}, 0)$, radius $\frac{1}{2}$)

$$(x - \frac{1}{2})^2 + y^2 = \frac{1}{4}$$

S_2 is the circle (centre $(\frac{1}{2}, 0)$, radius $\frac{1}{2}$)

$$(x - \frac{1}{2})^2 + y^2 = \frac{1}{4}, \text{ punctured at the origin.}$$

l is the line $x = 1$.

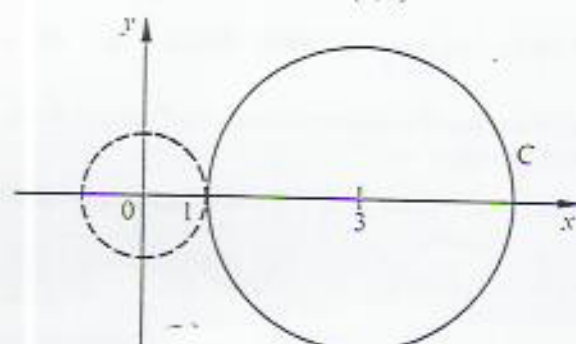
On three separate diagrams, sketch

- (i) S_1 and its image S_1' under inversion in C .
 (ii) S_2 and its image S_2' under inversion in C .
 (iii) l and its image l' under inversion in C .

No algebraic manipulation is required. [24]

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Let C be the circle of radius 2 centred at $(3, 0)$.



- (i) Draw a sketch showing the image C' of C under inversion in the unit circle.
 (ii) Determine the equation of C' . [2] [2] (87)