

## STEP III, 2000 Q1

- 1 Sketch on the same axes the two curves  $C_1$  and  $C_2$ , given by

$$\begin{aligned}C_1 : \quad xy &= 1, \\C_2 : \quad x^2 - y^2 &= 2.\end{aligned}$$

The curves intersect at  $P$  and  $Q$ . Given that the coordinates of  $P$  are  $(a, b)$  (which you need not evaluate), write down the coordinates of  $Q$  in terms of  $a$  and  $b$ .

The tangent to  $C_1$  through  $P$  meets the tangent to  $C_2$  through  $Q$  at the point  $M$ , and the tangent to  $C_2$  through  $P$  meets the tangent to  $C_1$  through  $Q$  at  $N$ . Show that the coordinates of  $M$  are  $(-b, a)$  and write down the coordinates of  $N$ .

Show that  $PMQN$  is a square.



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