

## STEP II, 2009, Q1

- 1 Two curves have equations  $x^4 + y^4 = u$  and  $xy = v$ , where  $u$  and  $v$  are positive constants. State the equations of the lines of symmetry of each curve.

The curves intersect at the distinct points  $A$ ,  $B$ ,  $C$  and  $D$  (taken anticlockwise from  $A$ ). The coordinates of  $A$  are  $(\alpha, \beta)$ , where  $\alpha > \beta > 0$ . Write down, in terms of  $\alpha$  and  $\beta$ , the coordinates of  $B$ ,  $C$  and  $D$ .

Show that the quadrilateral  $ABCD$  is a rectangle and find its area in terms of  $u$  and  $v$  only. Verify that, for the case  $u = 81$  and  $v = 4$ , the area is 14.



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