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LINE (Q 3, PAPER 2)

2002

3 (a) $a(-1, 4)$ and $b(5, -4)$ are two points. Find the equation of the perpendicular bisector of $[ab]$.

3 (b) f is the transformation $(x, y) \to (x', y')$ where $x' = 3x + y$ and $y' = x - 2y$. S is the square whose vertices are $(0, 0)$, $(1, 0)$, $(1, 1)$ and $(0, 1)$.

   (i)   Find the image of f of each of the four vertices of S.

   (ii)   Express x and y in terms of x' and y'.

   (iii) By considering the lines $ax + by + c = 0$ and $ax + by + d = 0$, or otherwise, prove that f maps every pair of parallel lines. (You may assume that f maps every line to a line.)

   (iv) Show both S and $f(S)$ on a diagram.

   (v)   Find the area of $f(S)$.

ANSWERS

3 (a) $3x - 4y - 6 = 0$

3 (b) (i) $(0, 0)$, $(3, 1)$, $(4, -1)$, $(1, -2)$ (ii) $x = \frac{1}{7}(2x' + y')$, $y = \frac{1}{7}(x' - 3y')$

    (v) 7