LINE (Q 3, PAPER 2)

1997

3 (a) A triangle has vertices $(1,-1),(5,1)$ and $(-\frac{5}{2},-5)$.
Find the area of the triangle.

(b) K_1 and K_2 are two lines with slopes m_1 and m_2, repectively.
If θ is an angle between K_1 and K_2, prove that

$$\tan\theta = \pm\left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|.$$

(c) f is the transformation $(x, y) \to (x', y')$ where

$$x' = 4x - y$$
$$y' = 2x + y.$$

For the points $a(0,0), b(-2,-5)$ and $c(4, 9)$, find $f(a)$, $f(b)$ and $f(c)$.

(i) L is the line ac. The image of L under f is the line $f(L)$.
Find the equation of the $f(L)$.

(ii) $f(M)$ is the image of the line M under f.
$f(M)$ is perpendicular to $f(L)$ and $f(b) \in f(M)$.
Find the equation of the line M.

ANSWERS

3 (a) 4.5

(c) $f(a) = (0,0)$, $f(b) = (-3,-9)$, $f(c) = (7,17)$

(i) $17x - 7y = 0$ (ii) $31x + 5y + 87 = 0$