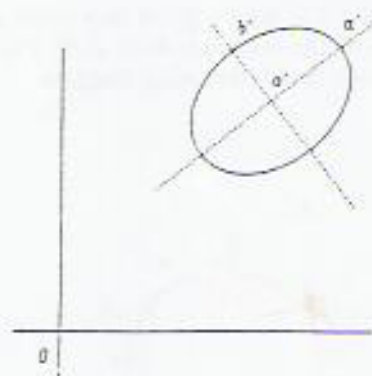
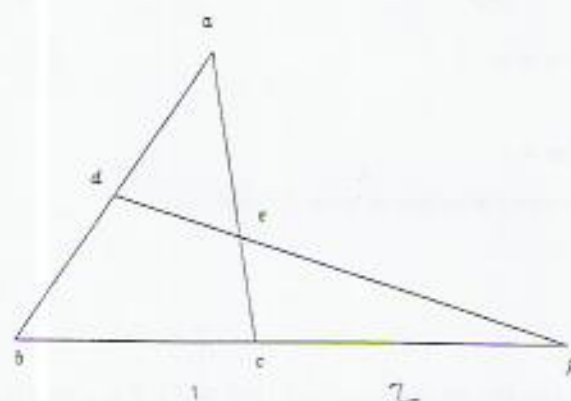


2

- (a) The figure below shows an ellipse with centre at the point o' , and with a' being an end of the major axis and b' an end of the minor axis. The points o' , a' and b' have coordinates $(6, 10)$, $(10, 12)$ and $(5, 12)$ respectively.



- (i) Find an affine transformation of the plane which maps the origin to o' , the point $(1, 0)$ to a' and the point $(0, 1)$ to b' .
 (ii) Use your answer to part (i) to find an affine transformation that maps the ellipse in the figure to the circle $x^2 + y^2 = 1$.
 (b) In the figure below, d is the mid-point of ab and the point e divides ac in the ratio $3 : 2$. Find the ratio $bc : cf$, quoting any theorems that you use.



[3]

(94)

3

- (i) Determine an affine transformation of \mathbb{R}^2 which maps the ellipse

$$\frac{x^2}{4} + \frac{y^2}{9} = 1$$

(*)

onto the circle centred at the origin and radius 1.

[4]

(88)

- (ii) Four distinct points P, Q, R, S lie on the ellipse(*). The line segments PQ and RS are parallel, and have midpoints U and V , respectively. Prove that the line segment UV passes through the origin.

[6]

4

Let XYZ denote the triangle of reference in \mathbb{RP}^2 . Let P be the Point $[2, 2, 1]$.

- (i) Find the equations of the Lines XP, YP, ZP .

[3]

- (ii) Find the Points of intersection

A of XP with YZ

B of YP with XZ

C of ZP with XY .

- (iii) Find the equation of AB .

[3]

- (iv) Find the Point of intersection D of AB with XY .

[1]

- (v) Calculate the cross-ratio $(XYCD)$.

[1]

(86)

[2]