QUESTIONS

1. The equation, in polar coordinates, of a curve is

$$r = a \sin\theta \cos^2\theta$$

where a is a positive constant and $0 \leq \theta \leq \pi$.

(i) Show that the greatest value of r is $\frac{2a\sqrt{3}}{9}$. [7]

(ii) Sketch the curve. [4]

2. Sketch the curve with polar equation $r = \sin\theta\ (1 - \cos\theta)$ for $0 \leq \theta \leq \pi$. [2]
Find

(i) the area enclosed by the curve. [6]

(ii) the polar coordinates of the point of the curve furthest from the origin. [4]

3. i) Sketch the curve $r = \sin\theta + \sqrt{3}\cos\theta$ for $0 \leq \theta \leq \frac{\pi}{2}$. [4]

ii) Find the maximum value of r and the angle at which it occurs. [5]

iii) Find the area bounded by the curve from $\theta = 0$ to $\theta = \frac{\pi}{2}$. [5]

4. The curve C has polar equation

$$r = 4\sin 2\theta \sin\theta,$$

where $0 \leq \theta < 2\pi$.

(a) Draw a sketch of C. [3]

(b) Using the results from parts **(i)** and **(ii)(a)** above, find the area of the region enclosed by one loop of the curve C. [4]