

Lesson 10

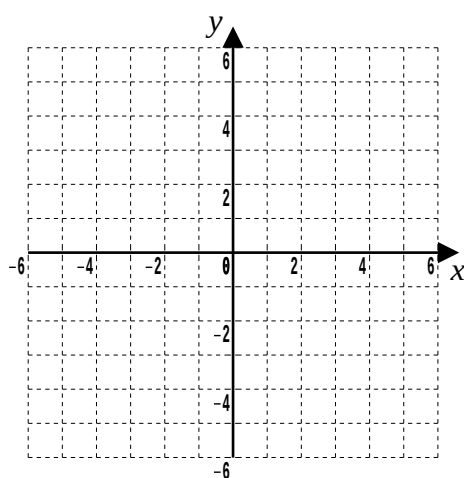
Further A-Level Pure Mathematics, Core 2 Polar Coordinates

10.1 Test

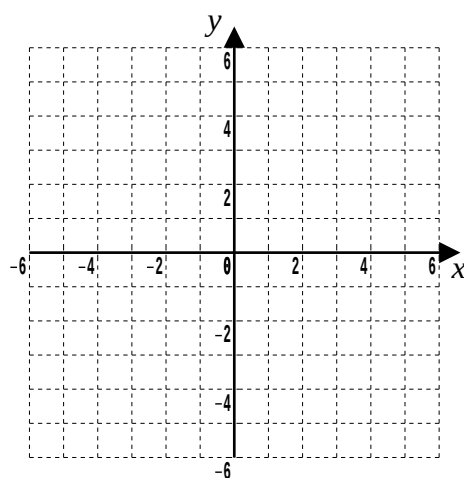
*Any solution based entirely on graphical
or numerical methods is not acceptable*
Marks Available : 40

Question 1

On each grid, sketch the graph of the polar equation given,

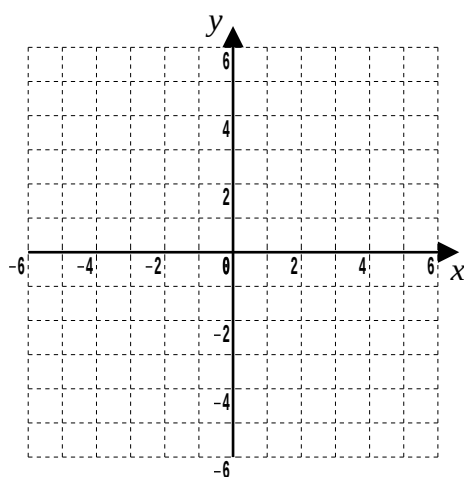


(i) $r = 6 \cos \theta$

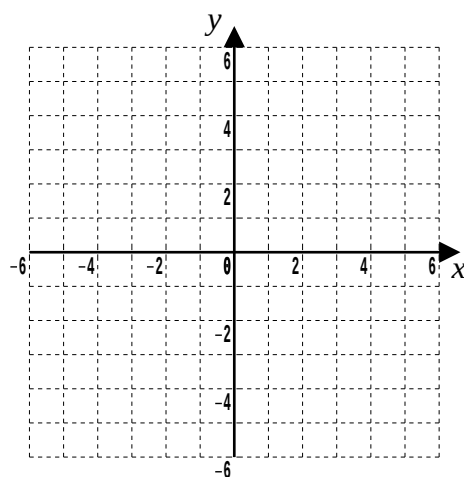


(ii) $r = \sec \theta$

[2, 2 marks]



(iii) $r = \frac{1}{2 \cos \theta + \sin \theta}$



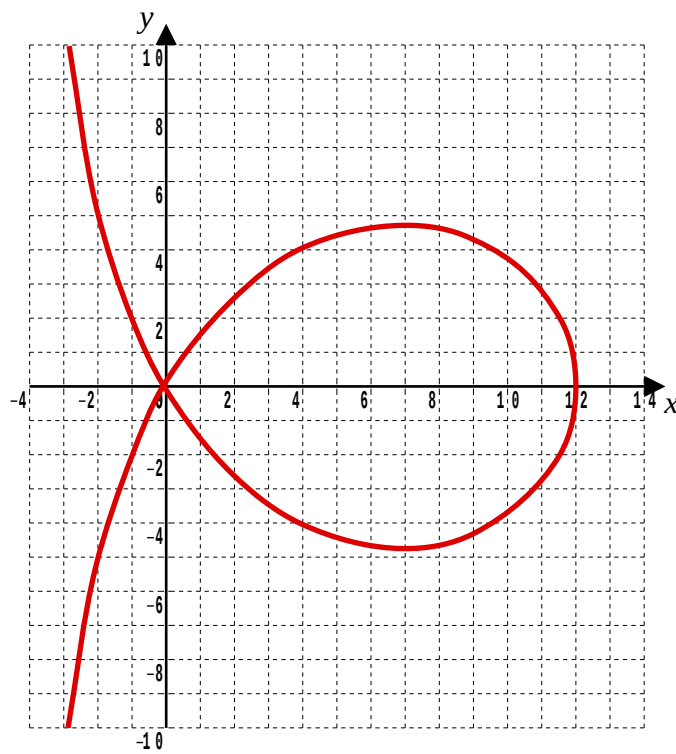
(iv) $r = 4\sqrt{2} \cos (\theta - 45^\circ)$

[2, 2 marks]

Question 2

The curve below is The Trisectrix of Maclaurin and has Cartesian equation

$$y^2(4 + x) = x^2(12 - x)$$



- (i) Show that The Trisectrix of Maclaurin has polar equation

$$r = \frac{4(2 \cos(2\theta) + 1)}{\cos \theta}$$

[4 marks]

- (ii) Show that the point with Cartesian coordinates (4, 4) is on the curve.

[2 marks]

- (iii) By means of implicit differentiation of the Cartesian equation show that

$$\frac{dy}{dx} = \frac{24x - 3x^2 - y^2}{8y + 2xy}$$

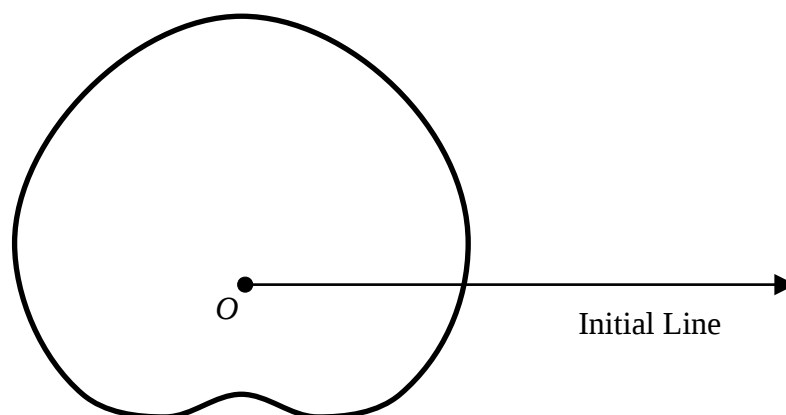
[4 marks]

- (iv) Find the equation of the tangent to the curve at the point (4, 4) in the form $ax + by + c = 0$ where a , b and c are integer constants.

[3 marks]

Question 3

Further A-Level Examination Question from June 2017, FP2, Q6 (Edexcel)



The sketch is of a curve with polar equation,

$$r = 6 + a \sin \theta$$

where $0 < a < 6$ and $0 \leq \theta < 2\pi$

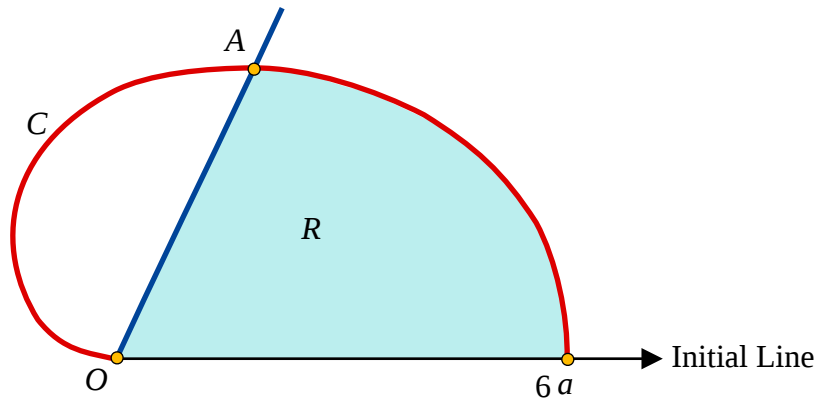
The area enclosed by the curve is $\frac{97\pi}{2}$

Find the value of the constant a

[8 marks]

Question 4

Further A-Level Examination Question from June 2015, FP2, Q6 (Edexcel)



The curve C has polar equation,

$$r = 3a(1 + \cos \theta), \quad 0 \leq \theta < \pi$$

The tangent to C at the point A is parallel to the initial line.

(a) Find the polar coordinates of A

[6 marks]

The finite region R , shown shaded, is bounded by the curve C , the initial line and the line OA

- (b) Use calculus to find the area of the shaded region R , giving your answer in the form $a^2(p\pi + q\sqrt{3})$, where p and q are rational numbers

[5 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com