

Parametrics

Difficulty: Medium

Question Paper 3

Level	A Level
Subject	Maths Pure 3
Exam Board	CIE
Topic	Differentiation
Sub-Topic	Parametrics
Difficulty	Medium
Booklet	Question Paper 3

Time allowed: 36 minutes

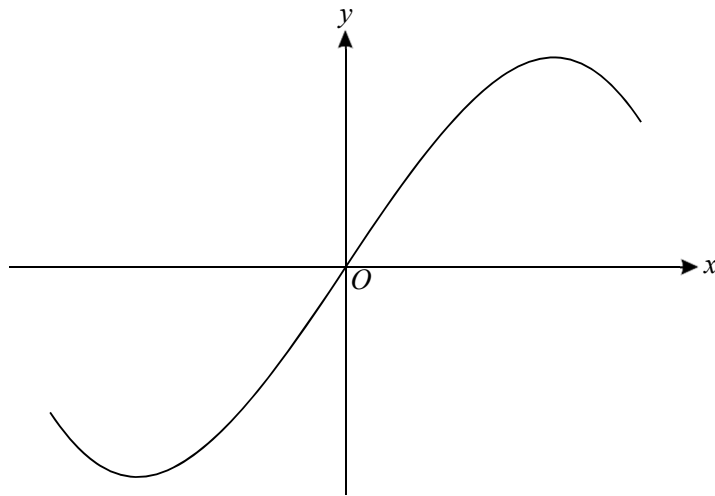
Score: /26

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E
>90%	81%	70%	58%	46%	34%

Question 1



The diagram shows the curve with parametric equations

$$x = \sin t + \cos t, \quad y = \sin^3 t + \cos^3 t,$$

for $\frac{1}{4}\pi < t < \frac{5}{4}\pi$.

(i) Show that $\frac{dy}{dx} = -3 \sin t \cos t$. [3]

(ii) Find the gradient of the curve at the origin. [2]

(ii) Find the values of t for which the gradient of the curve is 1, giving your answers correct to 2 significant figures. [4]

Question 2

The parametric equations of a curve are

$$x = \frac{4t}{2t+3}, \quad y = 2 \ln(2t+3).$$

(i) Express $\frac{dy}{dx}$ in terms of t , simplifying your answer. [4]

(ii) Find the gradient of the curve at the point for which $x = 1$. [2]

Question 3

The parametric equations of a curve are

$$x = e^{-t} \cos t, \quad y = e^{-t} \sin t.$$

Show that $\frac{dy}{dx} = \tan\left(t - \frac{1}{4}\pi\right)$. [6]

Question 4

A curve is defined for $0 < \theta < \frac{1}{2}\pi$ by the parametric equations

$$x = \tan \theta, \quad y = 2 \cos^2 \theta \sin \theta.$$

Show that $\frac{dy}{dx} = 6 \cos^5 \theta - 4 \cos^3 \theta$.

[5]