Differentiation – Parametric, Implicit, Products & Quotients

Question Paper 1

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Differentiation
Sub Topic	Differentiation – Parametric, Implicit, Products & Quotients
Booklet	Question Paper 1

Time Allowed: **57 minutes**

Score: **/47**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 The equation of a curve is

$$y = 6\sin x - 2\cos 2x.$$

Find the equation of the tangent to the curve at the point $\left(\frac{1}{6}\pi, 2\right)$. Give the answer in the form $y = mx + c$, where the values of m and c are correct to 3 significant figures. [5]

2 The equation of a curve is

$$y^3 + 4xy = 16.$$

(i) Show that $\frac{dy}{dx} = -\frac{4y}{3y^2 + 4x}$. [4]

(ii) Show that the curve has no stationary points. [2]

(iii) Find the coordinates of the point on the curve where the tangent is parallel to the y-axis. [4]

3 **(a)** Find the gradient of the curve

$$3\ln x + 4\ln y + 6xy = 6$$

at the point $(1, 1)$. [4]

(b) The parametric equations of a curve are

$$x = \frac{10}{t} - t, \qquad y = \sqrt{(2t - 1)}.$$

Find the gradient of the curve at the point $(-3, 3)$. [6]

4 Find the gradient of each of the following curves at the point for which $x = 0$.

(i) $y = 3\sin x + \tan 2x$ [3]

(ii) $y = \dfrac{6}{1 + \mathrm{e}^{2x}}$ [3]

5 The equation of a curve is

$$2x^2 + 3xy + y^2 = 3.$$

(i) Find the equation of the tangent to the curve at the point $(2, -1)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. [6]

(ii) Show that the curve has no stationary points. [4]

6 The parametric equations of a curve are

$$x = 2\ln(t + 1), \quad y = 4\mathrm{e}^t.$$

Find the equation of the tangent to the curve at the point for which $t = 0$. Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. [6]