Differentiation – Parametric, Implicit, Products & Quotients

Question Paper 2

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Differentiation
Sub Topic	Differentiation – Parametric, Implicit, Products & Quotients
Booklet	Question Paper 2

Time Allowed: **62 minutes**

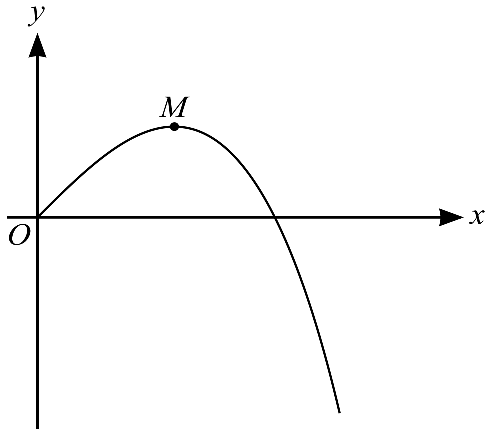
Score: **/51**

Percentage: **/100**

Grade Boundaries:

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

1



The diagram shows the curve

$$y = \tan x \cos 2x, \text{ for } 0 \leqslant x < \tfrac{1}{2}\pi,$$

and its maximum point M.

(i) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = 4\cos^2 x - \sec^2 x - 2$. [5]

(ii) Hence f nd the x-coordinate of M, giving your answer correct to 2 decimal places. [4]

2 The equation of a curve is $y = \mathrm{e}^{2x} \frac{1}{2} 5\mathrm{e}^{x} + 4x$. Find the exact x-coordinate of each of the stationary points of the curve and determine the nature of each stationary point. [6]

3 The curve $y = \dfrac{\mathrm{e}^{3x-1}}{2x}$ has one stationary point. Find the coordinates of this stationary point. [5]

4 The parametric equations of a curve are

$$x = e^{2t}, \quad y = 4te^{t}.$$

(i) Show that $\frac{dy}{dx} = \frac{2(t+1)}{e^t}$. [4]

(ii) Find the equation of the normal to the curve at the point where $t = 0$. [4]

5 The equation of a curve is

$$x^2 - 2x^2y + 3y = 9.$$

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

(ii) Find the equation of the normal to the curve at the point where $x = 2$, giving your answer in the form $ax + by + c = 0$. [4]

6 The parametric equations of a curve are

$$x = \ln(1 - 2t), \quad y = \frac{2}{t}, \quad \text{for } t < 0.$$

(i) Show that $\frac{dy}{dx} = \frac{1 - 2t}{t^2}$. [3]

(ii) Find the exact coordinates of the only point on the curve at which the gradient is 3. [3]

7 The equation of a curve is

$$3x^2 - 4xy + 2y^2 - 6 = 0.$$

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

(ii) Find the coordinates of each of the points on the curve where the tangent is parallel to the x-axis. [5]