Stationary Points

Question Paper 1

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Differentiation
Sub Topic	Stationary Points
Booklet	Question Paper 1

Time Allowed: **65 minutes**

Score: **/54**

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 $y = x^3 + px^2$, where p is a positive constant.

(i) Show that the origin is a stationary point on the curve and find the coordinates of the other stationary point in terms of p. [4]

(ii) Find the nature of each of the stationary points. [3]

Another curve has equation $y = x^3 + px^2 + px$.

(iii) Find the set of values of p for which this curve has no stationary points. [3]

2 Variables u, x and y are such that $u = 2x(y - x)$ and $x + 3y = 12$. Express u in terms of x and hence find the stationary value of u. [5]

3 The function f is defined for $x > 0$ and is such that $\mathrm{f}'(x) = 2x - \frac{2}{x^2}$. The curve $y = \mathrm{f}(x)$ passes through the point $P(2, 6)$.

(i) Find the equation of the normal to the curve at P. [3]

(ii) Find the equation of the curve. [4]

(iii) Find the x-coordinate of the stationary point and state with a reason whether this point is a maximum or a minimum. [4]

4 A curve is such that $\frac{\mathrm{d}^2y}{\mathrm{d}x^2} = \frac{24}{x^3} - 4$. The curve has a stationary point at P where $x = 2$.

(i) State, with a reason, the nature of this stationary point. [1]

(ii) Find an expression for $\frac{\mathrm{d}y}{\mathrm{d}x}$. [4]

(iii) Given that the curve passes through the point $(1, 13)$, find the coordinates of the stationary point P. [4]

5 A curve $y = f(x)$ has a stationary point at $(3, 7)$ and is such that $f''(x) = 36x^{-3}$.

(i) State, with a reason, whether this stationary point is a maximum or a minimum. [1]

(ii) Find $f'(x)$ and $f(x)$. [7]

6 A curve is such that $\frac{dy}{dx} = x^{\frac{1}{2}} - x^{-\frac{1}{2}}$. The curve passes through the point $\left(4, \frac{2}{3}\right)$.

(i) Find the equation of the curve. [4]

(ii) Find $\frac{d^2y}{dx^2}$. [2]

(iii) Find the coordinates of the stationary point and determine its nature. [5]