

6 A curve has parametric equations

$$x = \tan \theta, \quad y = \sin \theta - 2 \sin^3 \theta,$$

for $0 < \theta < \frac{1}{2}\pi$.

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

[4]

①

(b) Find the equation of the normal to the curve at the point where it crosses the x -axis. Give your answer in the form $y = mx + c$, where m and c are exact constants. [5]

[5]

.....
②

8

[6]

... ③

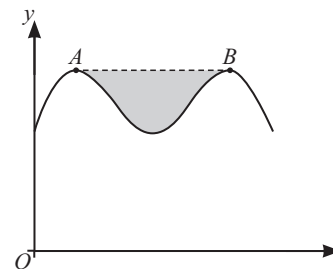
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Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

5

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The diagram shows the curve with equation $y = 4 \cos 2x + 8 \sin x$ for $0 \leq x \leq \pi$. The maximum points on the curve are denoted by A and B , and the shaded region is bounded by the line segment AB and the curve.

- (a) Find the coordinates of A and B .

[5]

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- [6]

⑦

- (a) Find an expression in terms of x and y for $\frac{dy}{dx}$ and hence find the gradient of the curve at the point for which $y = 0$. [6]

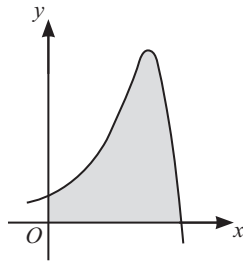
Show that there is no point on the curve at which the tangent is parallel to the y -axis. [2]

Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

- 1 Given that $y = 6x \cos(x^2 + 1)$, find an expression for $\frac{dy}{dx}$. [2]

[illegible]



(a) Find the exact x -coordinate of the maximum point. [3]

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12

6 The parametric equations of a curve are

$$x = \frac{2t+1}{3t+4}, \quad y = 2 \ln(3t+4),$$

where $t > -\frac{4}{3}$.

(a) Show that $\frac{dy}{dx}$ can be expressed in the form $c(3t+4)$ and state the value of the constant c . [5]

(b) It is given that the gradient of the curve at the point $(a, \ln 100)$ is m .

Find the values of a and m .

[4]

(c) State whether the curve represents a decreasing function or an increasing function or neither. Give a reason for your answer. [1]

- [5]

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- 6** A curve has equation $(x^2 - 3)\ln y + 6x = 14$.

- [3]

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- [6]

[illegible]

