

- 6 The parametric equations of a curve are

$$x = \sqrt{t} + 3, \quad y = \ln t,$$

for $t > 0$.

- (a) Obtain a simplified expression for $\frac{dy}{dx}$ in terms of t . [3]

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- (b) Hence find the exact coordinates of the point on the curve at which the gradient of the normal is -2 . [3]

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3 The parametric equations of a curve are

$$x = 3 - \cos 2\theta, \quad y = 2\theta + \sin 2\theta,$$

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

Show that $\frac{dy}{dx} = \cot \theta$.

[5]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

4 The parametric equations of a curve are

$$x = 1 - \cos \theta, \quad y = \cos \theta - \frac{1}{4} \cos 2\theta.$$

Show that $\frac{dy}{dx} = -2 \sin^2(\frac{1}{2}\theta)$. [5]

This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- 4 The parametric equations of a curve are

$$x = 2t - \tan t, \quad y = \ln(\sin 2t),$$

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

Show that $\frac{dy}{dx} = \cot t$.

[5]

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4 The parametric equations of a curve are

$$x = \frac{\cos \theta}{2 - \sin \theta}, \quad y = \theta + 2 \cos \theta.$$

Show that $\frac{dy}{dx} = (2 - \sin \theta)^2$. [5]

This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal dashed lines, providing a guide for letter height and placement. The lines are evenly spaced across the entire page, leaving ample room for writing practice. There is no text or other markings on the page.

2 The parametric equations of a curve are

$$x = (\ln t)^2, \quad y = e^{2-t^2},$$

for $t > 0$.

Find the gradient of the curve at the point where $t = e$, simplifying your answer.

[4]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

3 The parametric equations of a curve are

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

where $t > -2$.

(a) Express $\frac{dy}{dx}$ in terms of t , simplifying your answer. [5]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(b) Find the exact y-coordinate of the stationary point of the curve. [2]

[illegible]

- 6** The parametric equations of a curve are $x = \frac{1}{\cos t}$, $y = \ln \tan t$, where $0 < t < \frac{1}{2}\pi$.

(a) Show that $\frac{dy}{dx} = \frac{\cos t}{\sin^2 t}$. [5]

This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[3]

[illegible]

5 The parametric equations of a curve are

$$x = te^{2t}, \quad y = t^2 + t + 3.$$

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

[illegible]

- (b) Hence show that the normal to the curve, where $t = -1$, passes through the point $\left(0, 3 - \frac{1}{e^4}\right)$. [3]

[illegible]

6 The parametric equations of a curve are

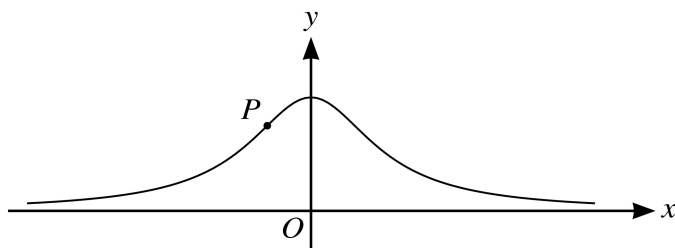
$$x = \ln(2 + 3t), \quad y = \frac{t}{2 + 3t}.$$

(a) Show that the gradient of the curve is always positive.

[5]

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

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

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

- (a) Show that the gradient of the curve at the point with parameter θ is $-2 \sin \theta \cos^3 \theta$. [3]

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[4]

[illegible]