

Question 2

- a. Find an antiderivative of $\frac{1}{3x-4}$ with respect to x .

1 mark

Question 2

- Find an anti-derivative of $\frac{1}{(2x-1)^3}$ with respect to x .

2 marks

Question 7

If $f(x) = x \cos(3x)$, then $f'(x) = \cos(3x) - 3x \sin(3x)$.

Use this fact to find an antiderivative of $x \sin(3x)$.

3 marks

Question 1

a. Let $y = (3x^2 - 5x)^5$. Find $\frac{dy}{dx}$.

b. Let $f(x) = xe^{3x}$. Evaluate $f'(0)$.

2 + 3 = 5 marks

Question 5

The area of the region bounded by the y -axis, the x -axis, the curve $y = e^{2x}$ and the line $x = C$, where C is a positive real constant, is $\frac{5}{2}$. Find C .

3 marks

Question 1

Let $f(x) = \frac{x^3}{\sin(x)}$. Find $f'(x)$.

2 marks

Instructions

Answer **all** questions in the spaces provided.

In all questions where a numerical answer is required an exact value must be given unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

- a. Differentiate $\sqrt{4-x}$ with respect to x .

1 mark

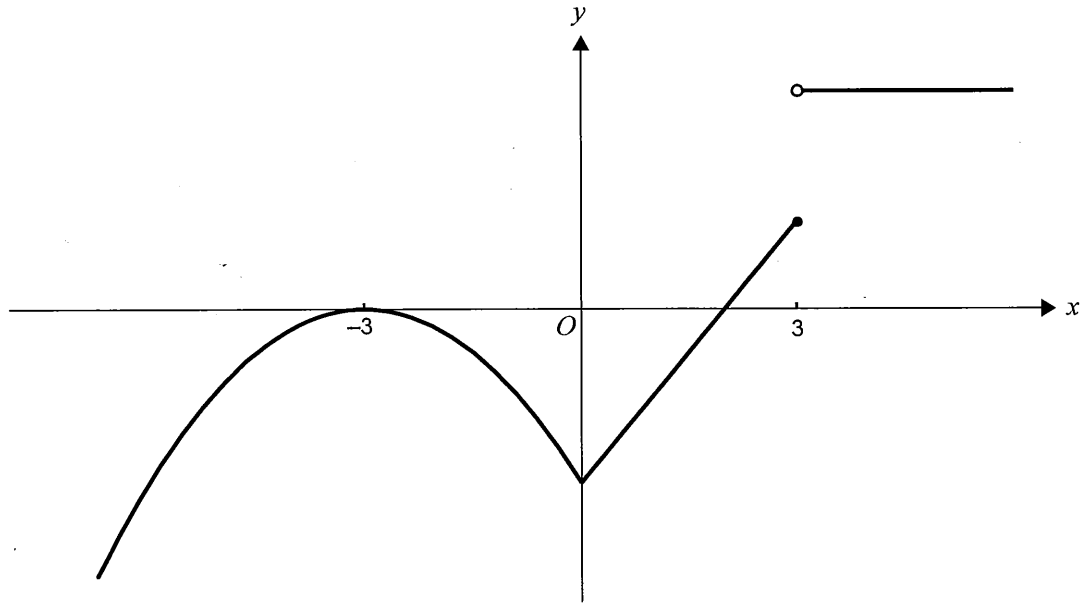
- b. If $g(x) = x^2 \sin(2x)$, find $g'\left(\frac{\pi}{6}\right)$.

2 marks

TURN OVER

Question 3

The diagram shows the graph of a function with domain R .



- a. For the graph shown above, sketch on the same set of axes the graph of the derivative function.

3 marks

- b. Write down the domain of the derivative function.

1 mark

Question 4

A wine glass is being filled with wine at a rate of $8 \text{ cm}^3/\text{s}$. The volume, $V \text{ cm}^3$, of wine in the glass when the depth of wine in the glass is $x \text{ cm}$ is given by $V = 4x^{\frac{3}{2}}$. Find the rate at which the depth of wine in the glass is increasing when the depth is 4 cm.

3 marks

Instructions

Answer **all** questions in the spaces provided.

In all questions where a numerical answer is required an exact value must be given unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

a. If $y = (x^2 - 5x)^4$, find $\frac{dy}{dx}$.

1 mark

b. If $f(x) = \frac{x}{\sin(x)}$, find $f'\left(\frac{\pi}{2}\right)$.

2 marks

TURN OVER

Question 10

Let $f: \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = e^{-mx} + 3x$, where m is a positive rational number.

- a. i. Find, in terms of m , the x -coordinate of the stationary point of the graph of $y = f(x)$.

- ii. State the values of m such that the x -coordinate of this stationary point is a positive number.

2 + 1 = 3 marks

- b. For a particular value of m , the tangent to the graph of $y = f(x)$ at $x = -6$ passes through the origin.
Find this value of m .

3 marks