AS · CIE · Maths

50 mins 10 questions

Practice Paper 2 (Pure 2)

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Total Marks **/50**

Solve the equation

1 $$\log_3(x+4) = 4 + 2\log_3 x$$

giving your answers correct to 3 significant figures.

(3 marks)

2 Show that $(5x-2)$ is a factor of $25x^3 + 55x^2 - 56x + 12$.

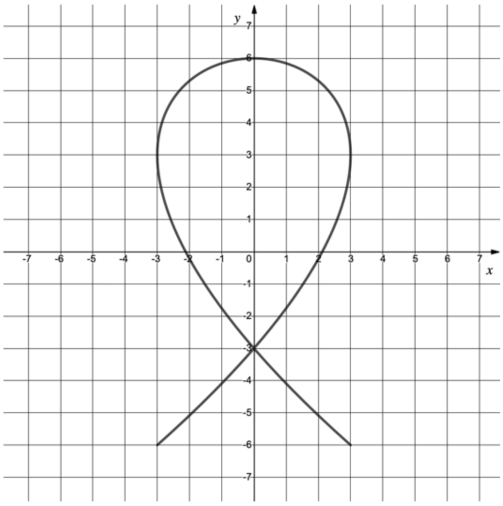
Hence find all the real solutions to the equation $25x^3 + 55x^2 - 56x + 12 = 0$.

(5 marks)

The graph of the curve C shown below is defined by the parametric equations

$$x = 3\sin 3\theta \qquad y = 6\cos 2\theta \qquad -\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$$

3 (a)



(a) (i) Write down the value of $\frac{dy}{d\theta}$ at the point $(0, 6)$.

(ii) Write down the value of $\frac{dx}{d\theta}$ at the points $(-3, 3)$ and $(3, 3)$.

(2 marks)

(b) (b) Find an expression for $\frac{dy}{dx}$ in terms of θ.

(3 marks)

(a) On the same axes, sketch the graphs of $y = \mathrm{f}(x)$ and $y = |\mathrm{g}(x)|$ where

4 (a)

$\mathrm{f}(x) = \sqrt{x}$ $\qquad x \geq 0$
$\mathrm{g}(x) = 2x - 3$ $\qquad x \in \mathbb{R}$

Label the points at which the graphs intersect the coordinate axes.

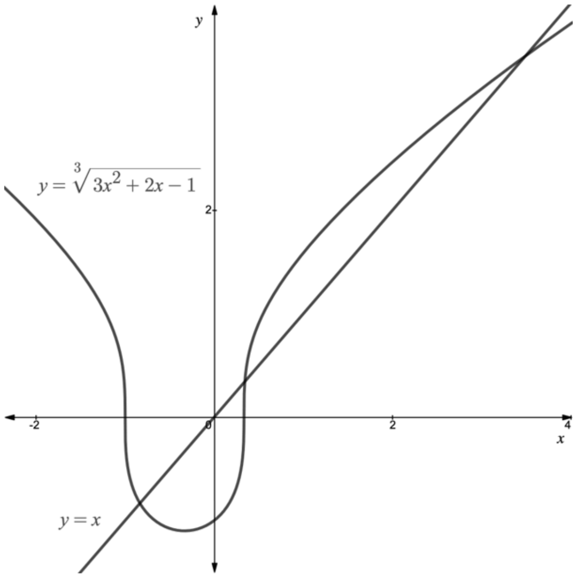
(3 marks)

(b) (b) Solve the equation $\mathrm{f}(x) = |\mathrm{g}(x)|$.

(3 marks)

The diagram below shows a sketch of the graphs $y = x$, and $y = \sqrt[3]{3x^2 + 2x - 1}$.

5 (a)



(a) An iterative formula is used to find roots to the equation $x^3 - 3x^2 - 2x + 1 = 0$.
On the diagram above show that the iterative formula

$$x_{n+1} = \sqrt[3]{3x_n^{\ 2} + 2x_n - 1}$$

would converge to the root close to $x = 3.5$ when using a starting value of $x_0 = 0.5$.

(2 marks)

(b)

(b) (i) Use $x_0 = 0.5$ in the iterative formula from part (a) to find three further approximations to the root close to $x = 3.5$.
Give each approximation correct to three significant figures.

(ii) Comment on your approximations and what they suggest about convergence to the root close to $x = 3.5$.

(2 marks)

(c) (c) Confirm that the root close to $x = 3.5$ is 3.49 correct to three significant figures.

(3 marks)

Show that

6

$$\cos 4\theta + \cos\frac{\pi}{3} \equiv 8\sin^4\theta - 8\sin^2\theta + \frac{3}{2}$$

(5 marks)

7 Solve the equation $\sec^2 2x = 1 + \tan 2x$ for $0° \leq x \leq 180°$.

(4 marks)

(a) Show that

8 (a)

$$\left(\cos\left(\theta+\frac{\pi}{8}\right)+\sin\left(\theta+\frac{\pi}{8}\right)\right)\left(\sin\left(\theta+\frac{\pi}{8}\right)-\cos\left(\theta+\frac{\pi}{8}\right)\right)\equiv-\cos\left(2\theta+\frac{\pi}{4}\right)$$

(3 marks)

(b) Hence, or otherwise, find the exact value of

(b)

$$\int_0^{\frac{\pi}{8}}\left(\sin^2\left(\theta+\frac{\pi}{8}\right)-\cos^2\left(\theta+\frac{\pi}{8}\right)\right)\ \mathrm{d}\theta$$

(3 marks)

It is given that

9 (a)

$$\frac{f(x)}{g(x)} = 2x + 3 - \frac{4}{x + 1}$$

(a) Why would assuming that $g(x) = x + 1$ be a logical first step in attempting to determine the precise forms of $f(x)$ and $g(x)$?

(1 mark)

(b) (b) By first making the assumption from part (a), find $f(x)$.

(2 marks)

(c) (c) Explain, with an example, why the forms of $f(x)$ and $g(x)$ determined in parts (a) and (b) are not the only possible forms for those functions.

(2 marks)

10 (a) (a) Find the integral

$$\int 5(e^{5x} - e^{-5x})\ \mathrm{d}x$$

(2 marks)

(b) (b) Find an expression for y given that

$$y = \int (\sin x + \cos x)\ \mathrm{d}x$$

(2 marks)