

AS Level Mathematics A

H230/01 Pure Mathematics and Statistics

Question Set 1

1 In this question you must show detailed reasoning.

(i) Express $3^{\frac{7}{2}}$ in the form $a\sqrt{b}$, where a is an integer and b is a prime number. [2]

(ii) Express $\frac{\sqrt{2}}{1-\sqrt{2}}$ in the form $c + d\sqrt{e}$, where c and d are integers and e is a prime number. [3]

2 (i) The equation $x^2 + 3x + k = 0$ has repeated roots. Find the value of the constant k . [2]

(ii) Solve the inequality $6 + x - x^2 > 0$. [2]

3 (i) Solve the equation $\sin^2\theta = 0.25$ for $0^\circ \leq \theta < 360^\circ$. [3]

(ii) **In this question you must show detailed reasoning.**

Solve the equation $\tan 3\phi = \sqrt{3}$ for $0^\circ \leq \phi < 90^\circ$. [3]

4 (i) It is given that $y = x^2 + 3x$.

(a) Find $\frac{dy}{dx}$. [2]

(b) Find the values of x for which y is increasing. [2]

(ii) Find $\int (3 - 4\sqrt{x}) dx$. [5]

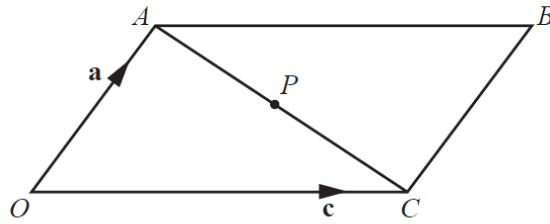
5 N is an integer that is not divisible by 3. Prove that N^2 is of the form $3p + 1$, where p is an integer. [5]

6 Sketch the following curves.

(i) $y = \frac{2}{x}$ [2]

(ii) $y = x^3 - 6x^2 + 9x$ [5]

- 7 $OABC$ is a parallelogram with $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$. P is the midpoint of AC .



- (i) Find the following in terms of \mathbf{a} and \mathbf{c} , simplifying your answers.

(a) \overrightarrow{AC} [1]

(b) \overrightarrow{OP} [2]

- (ii) Hence prove that the diagonals of a parallelogram bisect one another. [4]

- 8 In this question you must show detailed reasoning.

The lines $y = \frac{1}{2}x$ and $y = -\frac{1}{2}x$ are tangents to a circle at $(2, 1)$ and $(-2, 1)$ respectively. Find the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$, where a , b and c are constants. [6]

Total Marks for Question Set 1: 49

OCR

Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge