Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

ADDITIONAL MATHEMATICS **0606/13**

Paper 1 **May/June 2018**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 80.

This document consists of **16** printed pages.

© UCLES 2018

Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial Theorem

$$(a + b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \ldots + \binom{n}{r} a^{n-r} b^r + \ldots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for ΔABC

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} bc \sin A$$

© UCLES 2018

1 Solve the equations

$$y - x = 4,$$

$$x^2 + y^2 - 8x - 4y - 16 = 0.$$

View solution

[5]

2 Find the equation of the perpendicular bisector of the line joining the points (1, 3) and (4, −5). Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. [5]

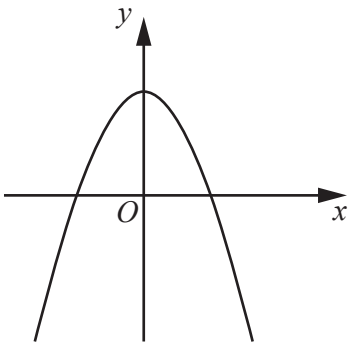
View solution

© UCLES 2018

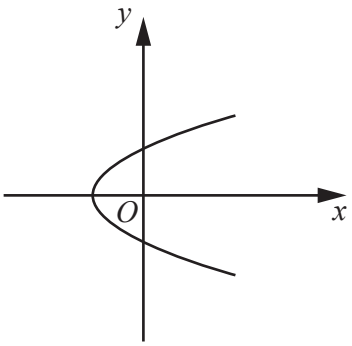
3 Diagrams **A** to **D** show four different graphs. In each case the whole graph is shown and the scales on the two axes are the same.

View solution

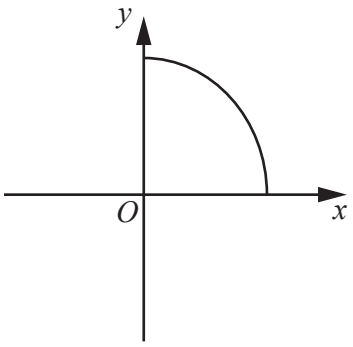
A



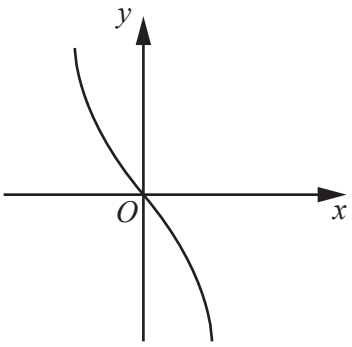
B



C



D



Place ticks in the boxes in the table to indicate which descriptions, if any, apply to each graph. There may be more than one tick in any row or column of the table. [4]

	A	**B**	**C**	**D**
Not a function				
One-one function				
A function that is its own inverse				
A function with no inverse				

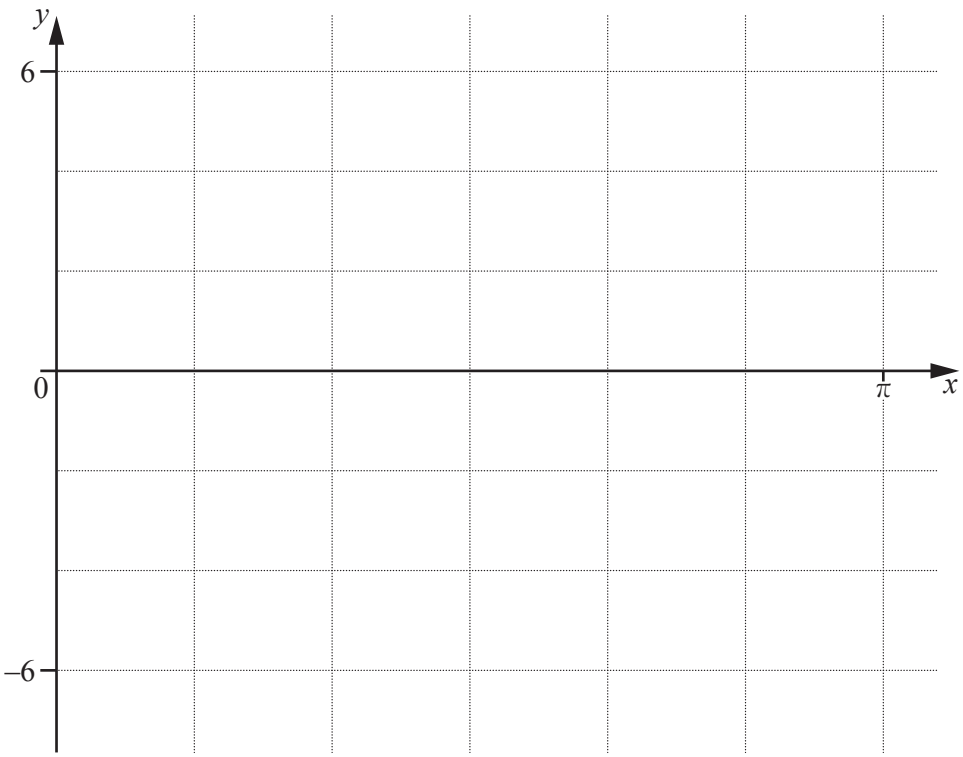
© UCLES 2018

4 **(i)** The curve $y = a + b\sin cx$ has an amplitude of 4 and a period of $\frac{\pi}{3}$. Given that the curve passes through the point $\left(\frac{\pi}{12}, 2\right)$, find the value of each of the constants a, b and c. [4]

View solution

(ii) Using your values of a, b and c, sketch the graph of $y = a + b\sin cx$ for $0 \leqslant x \leqslant \pi$ radians. [3]

View solution



5 The population, P, of a certain bacterium t days after the start of an experiment is modelled by $P = 800e^{kt}$, where k is a constant.

(i) State what the figure 800 represents in this experiment. [1]

View solution

(ii) Given that the population is 20 000 two days after the start of the experiment, calculate the value of k. [3]

View solution

(iii) Calculate the population three days after the start of the experiment. [2]

View solution

6 **(a)** Write $(\log_2 p)(\log_3 2) + \log_3 q$ as a single logarithm to base 3. [3]

View solution

(b) Given that $(\log_a 5)^2 - 4\log_a 5 + 3 = 0$, find the possible values of a. [3]

View solution

© UCLES 2018

7 **(i)** Find the inverse of the matrix $\begin{pmatrix} 4 & -2 \\ -5 & 3 \end{pmatrix}$. [2]

View solution

(ii) Hence solve the simultaneous equations

$$8x - 4y - 5 = 0,$$
$$-10x + 6y - 7 = 0.$$

[4]

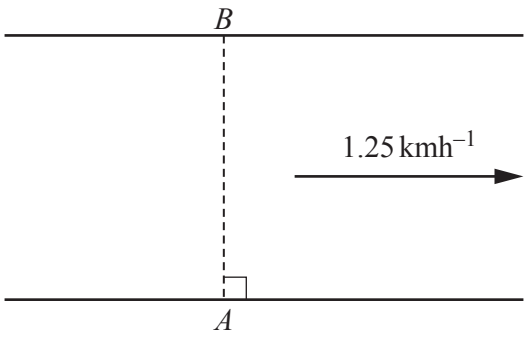
View solution

8 **(a)** Given that $\mathbf{p} = 2\mathbf{i} - 5\mathbf{j}$ and $\mathbf{q} = \mathbf{i} - 3\mathbf{j}$, find the unit vector in the direction of $3\mathbf{p} - 4\mathbf{q}$. [4]

View solution

(b)

View solution



A river flows between parallel banks at a speed of $1.25\,\text{kmh}^{-1}$. A boy standing at point A on one bank sends a toy boat across the river to his father standing directly opposite at point B. The toy boat, which can travel at $v\,\text{kmh}^{-1}$ in still water, crosses the river with resultant speed $2.73\,\text{kmh}^{-1}$ along the line AB.

(i) Calculate the value of v. [2]

© UCLES 2018

The direction in which the boy points the boat makes an angle θ with the line AB.

(ii) Find the value of θ. [2]

View solution

9 **(i)** Find the first 3 terms in the expansion of $\left(2x - \frac{1}{16x}\right)^8$ in descending powers of x. [3]

View solution

(ii) Hence find the coefficient of x^4 in the expansion of $\left(2x - \frac{1}{16x}\right)^8 \left(\frac{1}{x^2} + 1\right)^2$. [3]

View solution

© UCLES 2018

10 Do not use a calculator in this question.

(a) Simplify $\dfrac{5+6\sqrt{5}}{6+\sqrt{5}}$. [3]


View solution

(b) Show that $3^{0.5} \times (\sqrt{2})^7$ can be written in the form $a\sqrt{b}$, where a and b are integers and $a > b$. [2]

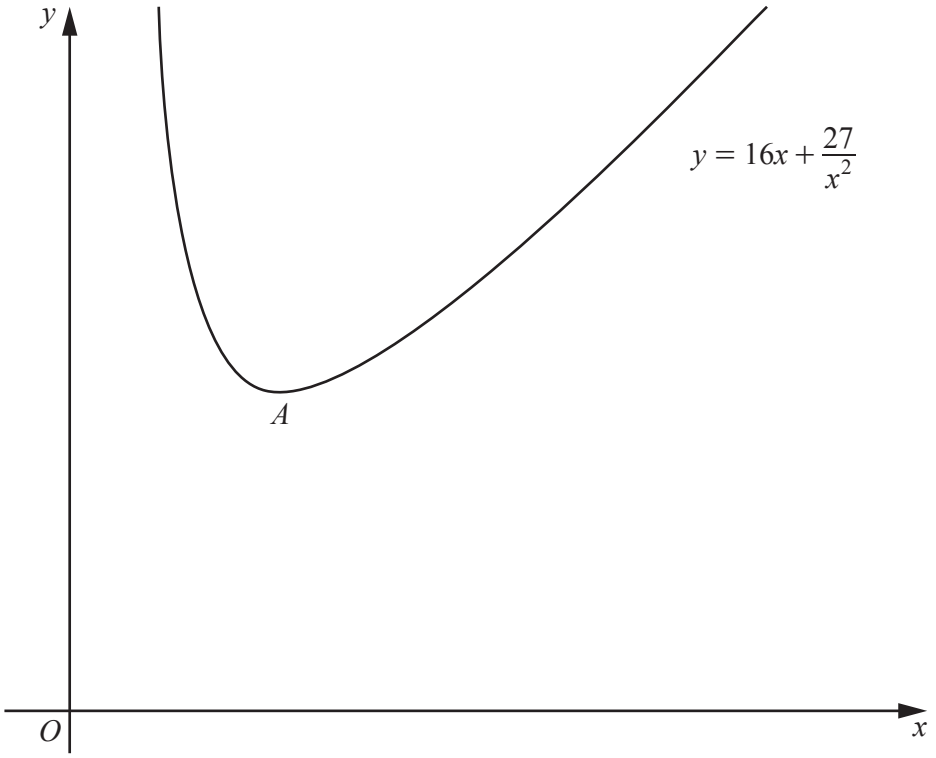

View solution

(c) Solve the equation $x + \sqrt{2} = \dfrac{4}{x}$, giving your answers in simplest surd form. [4]


View solution

© UCLES 2018

11



The diagram shows part of the graph of $y = 16x + \frac{27}{x^2}$, which has a minimum at A.

(i) Find the coordinates of A. [4]

View solution

The points P and Q lie on the curve $y = 16x + \frac{27}{x^2}$ and have x-coordinates 1 and 3 respectively.

(ii) Find the area enclosed by the curve and the line PQ. You must show all your working. [6]

View solution

Question 12 is printed on the next page.

© UCLES 2018

12 A curve is such that $\frac{d^2y}{dx^2} = (2x-5)^{-\frac{1}{2}}$. Given that the curve has a gradient of 6 at the point $\left(\frac{9}{2}, \frac{2}{3}\right)$, find the equation of the curve. [8]

View solution

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations 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.

© UCLES 2018