UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5899832647

ADDITIONAL MATHEMATICS **0606/22**

Paper 2 **May/June 2013**

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 a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, 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 **15** printed pages and **1** blank page.

© UCLES 2013

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

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

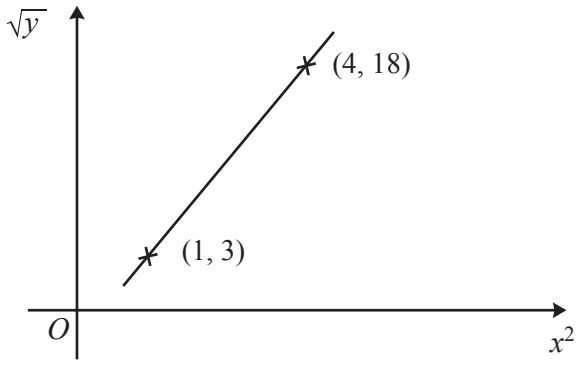
$$a^2 = b^2 + c^2 - 2bc \cos A$$

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

© UCLES 2013

1

For Examiner's Use



Variables x and y are such that when $\sqrt{y}$ is plotted against x^2 a straight line graph passing through the points (1, 3) and (4, 18) is obtained. Express y in terms of x. [4]

2 **(a)** Solve the equation $3^{p+1} = 0.7$, giving your answer to 2 decimal places. [3]

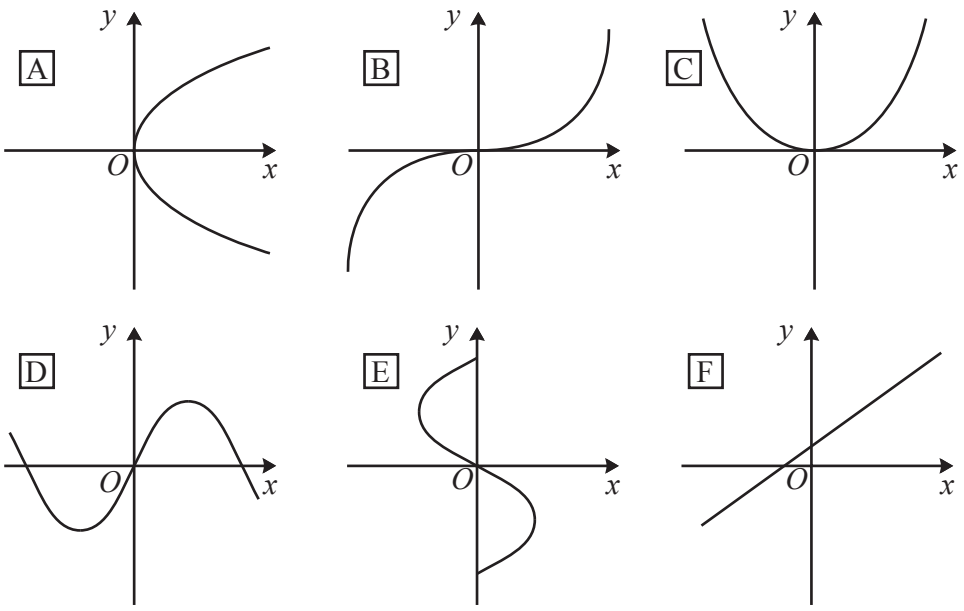
For Examiner's Use

(b) Express $\dfrac{y \times (4x^3)^2}{\sqrt{8y^3}}$ in the form $2^a \times x^b \times y^c$, where a, b and c are constants. [3]

© UCLES 2013

For Examiner's Use

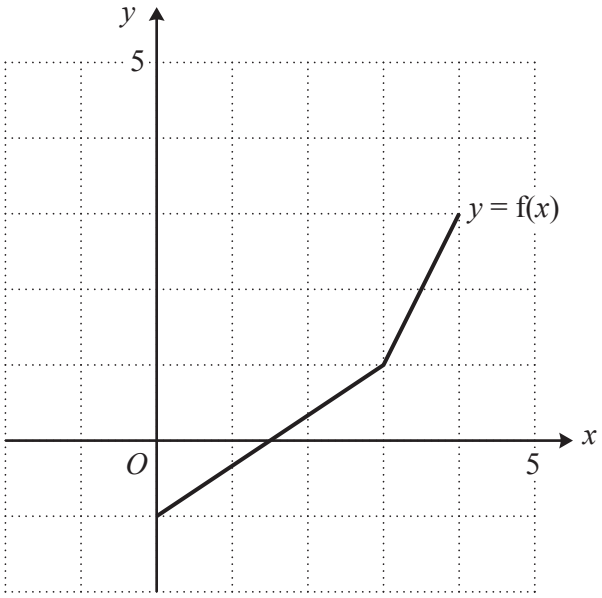
3 **(a)**



(i) Write down the letter of each graph which does **not** represent a function. [2]

(ii) Write down the letter of each graph which represents a function that does **not** have an inverse. [2]

(b)



The diagram shows the graph of a function $y = f(x)$. On the same axes sketch the graph of $y = f^{-1}(x)$. [2]

4 The position vectors of the points A and B, relative to an origin O, are $4\mathbf{i} - 21\mathbf{j}$ and $22\mathbf{i} - 30\mathbf{j}$ respectively. The point C lies on AB such that $\overrightarrow{AB} = 3\overrightarrow{AC}$.

For Examiner's Use

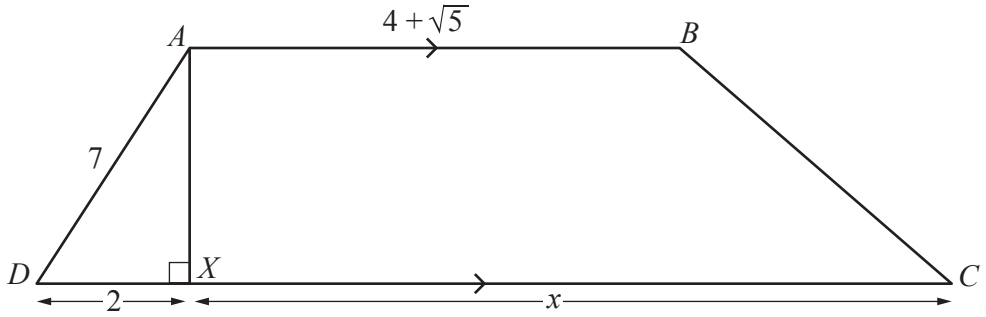
(i) Find the position vector of C relative to O. [4]

(ii) Find the unit vector in the direction $\overrightarrow{OC}$. [2]

© UCLES 2013

5 Calculators must not be used in this question.

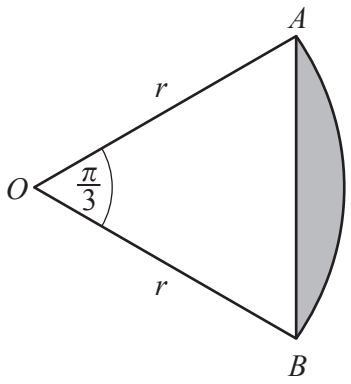
For Examiner's Use



The diagram shows a trapezium $ABCD$ in which $AD = 7\,\text{cm}$ and $AB = (4 + \sqrt{5})\,\text{cm}$. AX is perpendicular to DC with $DX = 2\,\text{cm}$ and $XC = x\,\text{cm}$. Given that the area of trapezium $ABCD$ is $15(\sqrt{5} + 2)\,\text{cm}^2$, obtain an expression for x in the form $a + b\sqrt{5}$, where a and b are integers. [6]

6

For Examiner's Use



The shaded region in the diagram is a segment of a circle with centre O and radius r cm.

Angle $AOB = \frac{\pi}{3}$ radians.

(i) Show that the perimeter of the segment is $r\left(\frac{3+\pi}{3}\right)$ cm. [2]

(ii) Given that the perimeter of the segment is 26 cm, find the value of r and the area of the segment. [5]

© UCLES 2013

7 Differentiate, with respect to x,

For Examiner's Use

(i) $(3 - 5x)^{12}$, [2]

(ii) $x^2 \sin x$, [2]

(iii) $\dfrac{\tan x}{1 + e^{2x}}$. [4]

8 Solutions to this question by accurate drawing will not be accepted.

For Examiner's Use

The points $A(-6, 2)$, $B(2, 6)$ and C are the vertices of a triangle.

(i) Find the equation of the line AB in the form $y = mx + c$. [2]

(ii) Given that angle $ABC = 90°$, find the equation of BC. [2]

(iii) Given that the length of AC is 10 units, find the coordinates of each of the two possible positions of point C. [4]

For Examiner's Use

9 **(a)** The graph of $y = k(3^x) + c$ passes through the points (0, 14) and (−2, 6). Find the value of k and of c. [3]

For Examiner's Use

(b) The variables x and y are connected by the equation $y = e^x + 25 - 24e^{-x}$.

(i) Find the value of y when $x = 4$. [1]

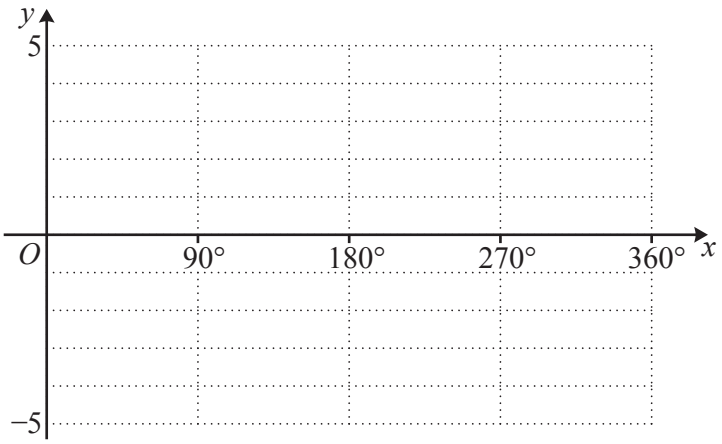
(ii) Find the value of e^x when $y = 20$ and hence find the corresponding value of x. [4]

© UCLES 2013

10 **(a)** The function f is defined, for $0° \leqslant x \leqslant 360°$, by $f(x) = 1 + 3\cos 2x$.

For Examiner's Use

(i) Sketch the graph of $y = f(x)$ on the axes below. [4]



(ii) State the amplitude of f. [1]

(iii) State the period of f. [1]

(b) Given that $\cos x = p$, where $270° < x < 360°$, find $\operatorname{cosec} x$ in terms of p. [3]

For Examiner's Use

11 A curve has equation $y = 3x + \frac{1}{(x-4)^3}$.

(i) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. [4]

(ii) Show that the coordinates of the stationary points of the curve are (5, 16) and (3, 8). [2]

(iii) Determine the nature of each of these stationary points. [2]

© UCLES 2013

(iv) Find $\int\left(3x + \frac{1}{(x-4)^3}\right) \mathrm{d}x$. [2]

For Examiner's Use

(v) Hence find the area of the region enclosed by the curve, the line $x = 5$, the x-axis and the line $x = 6$. [2]

BLANK PAGE

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.

University of 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 2013