UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2895163768

ADDITIONAL MATHEMATICS **4037/11**

Paper 1 **May/June 2012**

2 hours

Candidates answer on the Question Paper.

No additional materials are required.

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.

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Total	

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

DC (SM/SW) 41599/3

UNIVERSITY of CAMBRIDGE International Examinations

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

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

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

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

Formulae for ΔABC

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

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

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

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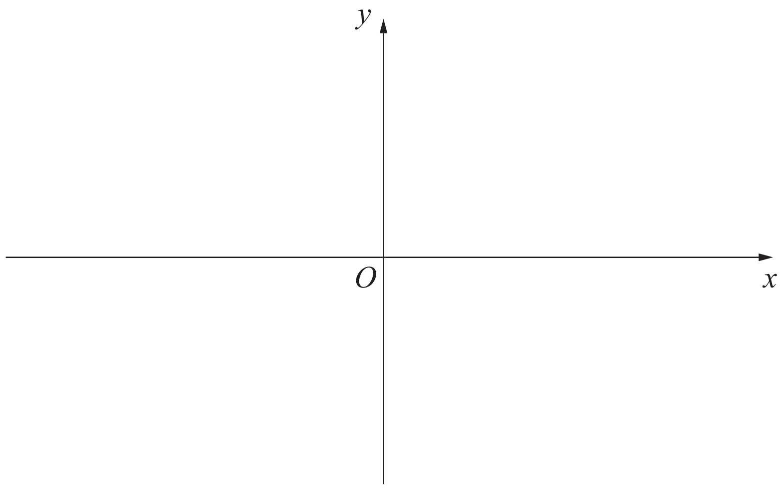
1 **(i)** Sketch the graph of $y = |2x - 5|$, showing the coordinates of the points where the graph meets the coordinate axes. [2]



(ii) Solve $|2x - 5| = 3$. [2]

2 The expression $2x^3 + ax^2 + bx - 30$ is divisible by $x + 2$ and leaves a remainder of -35 when divided by $2x - 1$. Find the values of the constants a and b. [5]

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3 Find the set of values of k for which the line $y = 2x + k$ cuts the curve $y = x^2 + kx + 5$ at two distinct points. [6]

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4 **(a)** Arrangements containing 5 different letters from the word AMPLITUDE are to be made. Find

(i) the number of 5-letter arrangements if there are no restrictions, [1]

(ii) the number of 5-letter arrangements which start with the letter A and end with the letter E. [1]

(b) Tickets for a concert are given out randomly to a class containing 20 students. No student is given more than one ticket. There are 15 tickets.

(i) Find the number of ways in which this can be done. [1]

There are 12 boys and 8 girls in the class. Find the number of different ways in which

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(ii) 10 boys and 5 girls get tickets, [3]

(iii) all the boys get tickets. [1]

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5 **(i)** Find the equation of the tangent to the curve $y = x^3 + 2x^2 - 3x + 4$ at the point where the curve crosses the y-axis. [4]

(ii) Find the coordinates of the point where this tangent meets the curve again. [3]

6 **(i)** Given that $15\cos^2\theta + 2\sin^2\theta = 7$, show that $\tan^2\theta = \frac{8}{5}$. [4]

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(ii) Solve $15\cos^2\theta + 2\sin^2\theta = 7$ for $0 \leqslant \theta \leqslant \pi$ radians. [3]

7 The table shows values of variables x and y.

x	1	3	6	10	14
y	2.5	4.5	0	–20	–56

(i) By plotting a suitable straight line graph, show that y and x are related by the equation $y = Ax + Bx^2$, where A and B are constants. [4]

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(ii) Use your graph to find the value of A and of B. [4]

8 **(a)** Find the value of x for which $2\lg x - \lg(5x + 60) = 1$. [5]

(b) Solve $\log_5 y = 4\log_y 5$. [4]

9 Find the values of the positive constants p and q such that, in the binomial expansion of $(p + qx)^{10}$, the coefficient of x^5 is 252 and the coefficient of x^3 is 6 times the coefficient of x^2. [8]

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10 Variables x and y are such that $y = e^{2x} + e^{-2x}$.

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

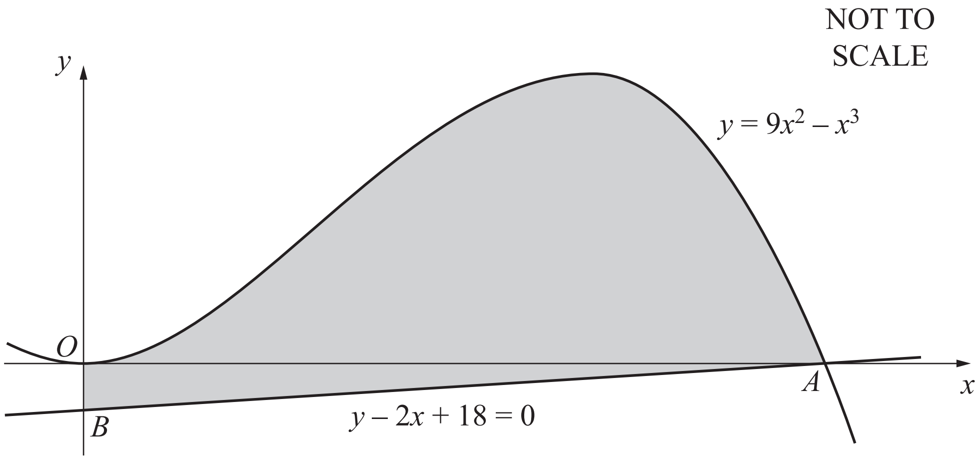
(ii) By using the substitution $u = e^{2x}$, find the value of y when $\frac{dy}{dx} = 3$. [4]

(iii) Given that x is decreasing at the rate of 0.5 units s^{-1}, find the corresponding rate of change of y when $x = 1$. [3]

Answer only **one** of the following two alternatives.

11 EITHER

The diagram shows part of the curve $y = 9x^2 - x^3$, which meets the x-axis at the origin O and at the point A. The line $y - 2x + 18 = 0$ passes through A and meets the y-axis at the point B.

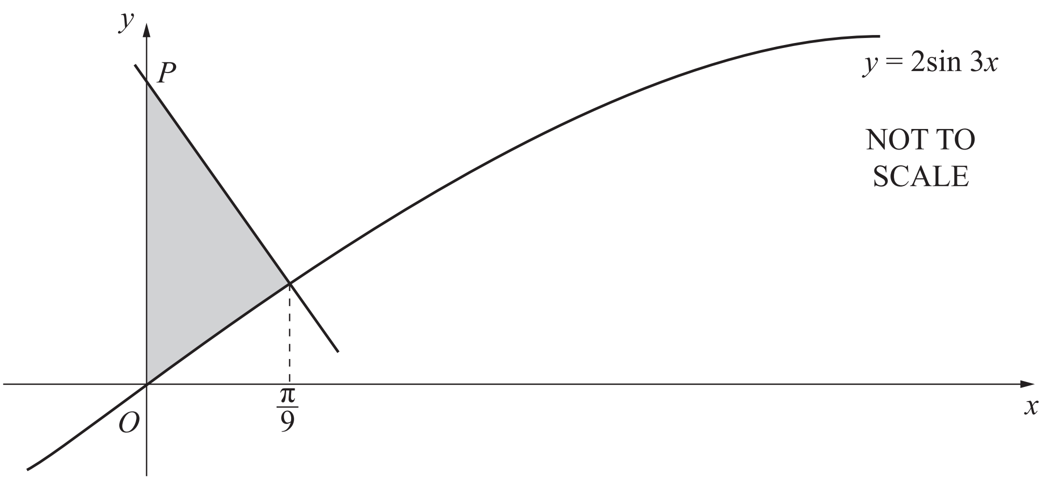


(i) Show that, for $x \geqslant 0$, $9x^2 - x^3 \leqslant 108$. [4]

(ii) Find the area of the shaded region bounded by the curve, the line AB and the y-axis. [6]

OR

The diagram shows part of the curve $y = 2\sin 3x$. The normal to the curve $y = 2\sin 3x$ at the point where $x = \frac{\pi}{9}$ meets the y-axis at the point P.



(i) Find the coordinates of P. [5]

(ii) Find the area of the shaded region bounded by the curve, the normal and the y-axis. [5]

Start your answer to Question 11 here.

Indicate which question you are answering.

EITHER	
OR	

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Continue your answer here if necessary.

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