UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

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ADDITIONAL MATHEMATICS **0606/11**

Paper 1 **May/June 2012**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator

For Examiner's Use	
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Total	

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

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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

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

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

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

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]

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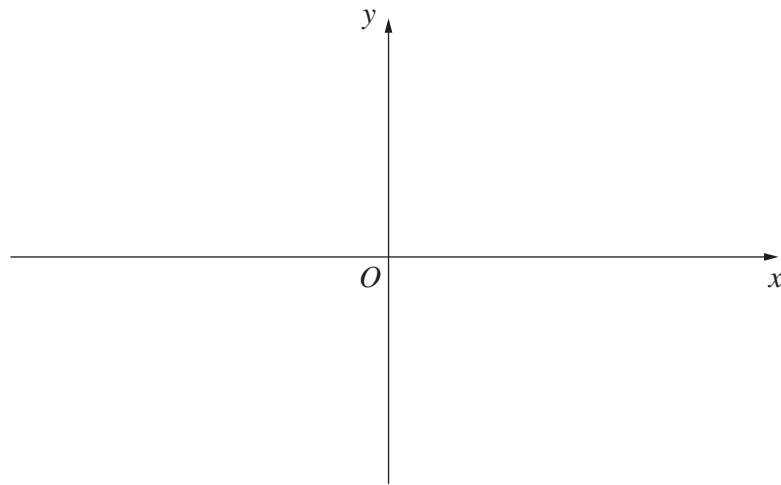
2 The expression $2x^3 + ax^2 + bx - 30$ is divisible by $x + 2$ and leaves a remainder of -35 when divided by $2x - 1$. Find the values of the constants a and b. [5]

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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]

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

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

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

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 $\tan^2\theta = \dfrac{8}{5}$. [4]

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

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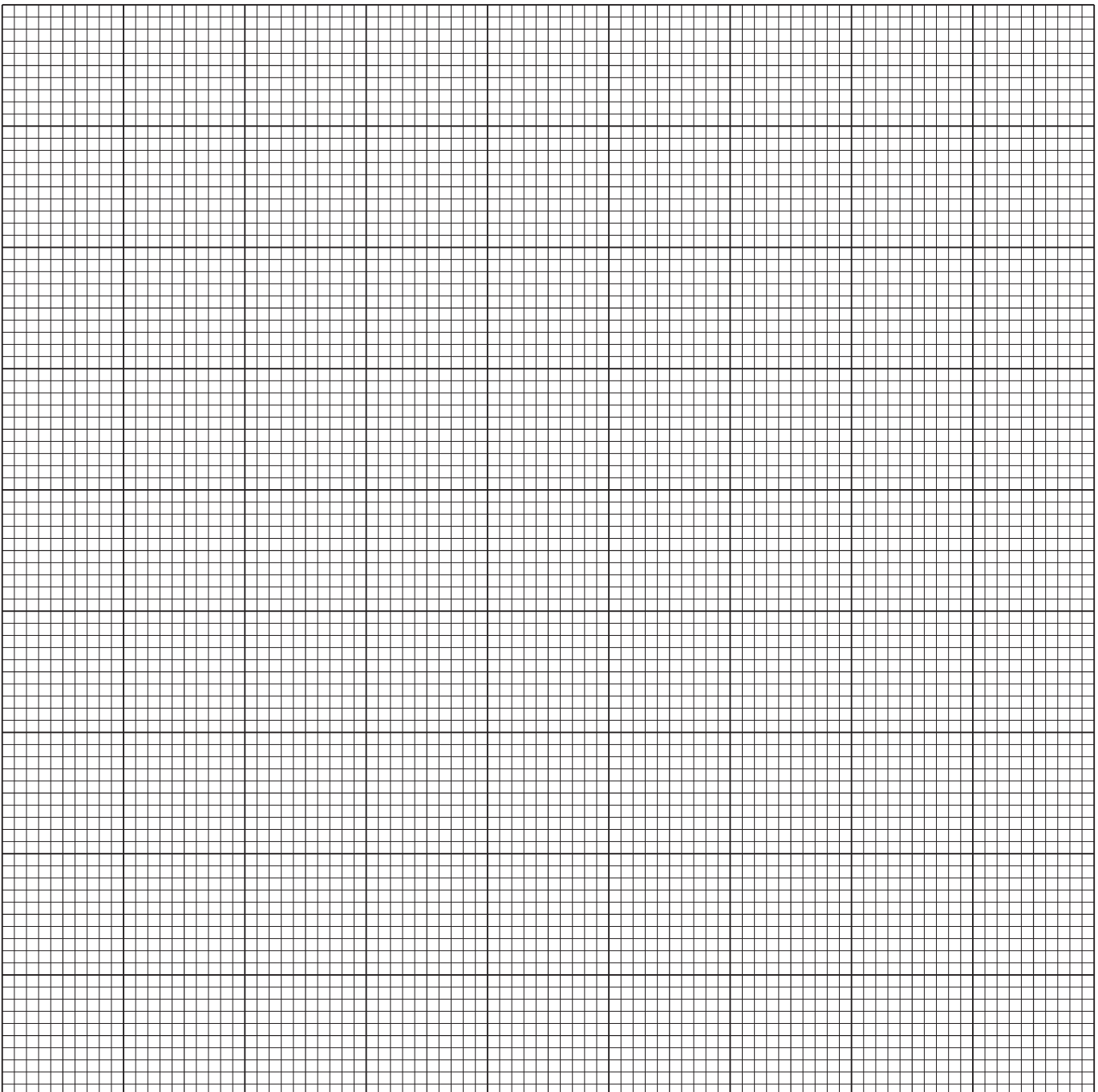
(ii) Use your graph to find the value of A and of B. [4]

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]

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

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

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

NOT TO
SCALE

$y = 9x^2 - x^3$

O

A

x

B

$y - 2x + 18 = 0$
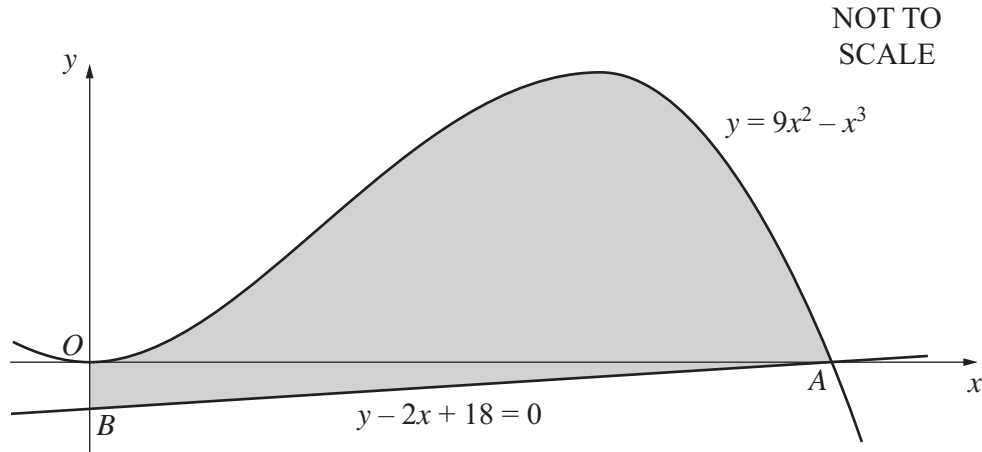
(i) Show that, for $x \geqslant 0$, $9x^2 - x^3 \leqslant 108$. [4]

(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 $x = \dfrac{\pi}{9}$ meets the y-axis at the point P.

y

P

$y = 2\sin 3x$

NOT TO
SCALE

$\dfrac{\pi}{9}$

O

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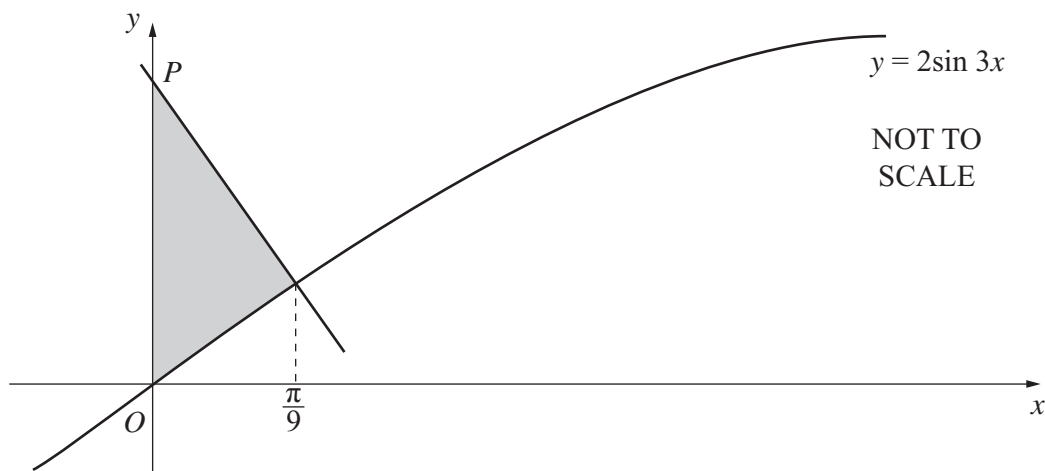
(i) Find the coordinates of P. [5]

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

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Start your answer to Question 11 here.

Indicate which question you are answering.

EITHER	
OR	

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