UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

ADDITIONAL MATHEMATICS **0606/01**

Paper 1 **May/June 2007**

2 hours

Additional Materials: Answer Booklet/Paper, Electronic calculator, Graph paper, Mathematical tables

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
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 soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the questions.
Write your answers on the separate Answer Booklet/Paper provided.
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 **6** printed pages and **2** blank pages.

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

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

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

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

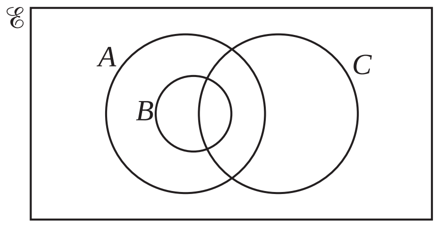
Formulae for ΔABC

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

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

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

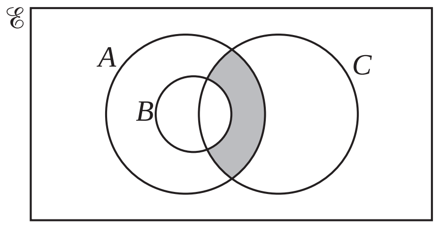
1 **(a)**



The diagram above shows a universal set ℰ and the three sets *A*, *B* and *C*.

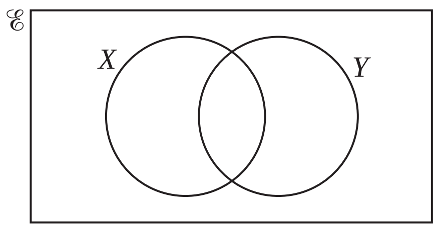
(i) Copy the above diagram and shade the region representing $(A \cap C') \cup B$. [1]

(ii)



Express, in set notation, the set represented by the shaded region in the diagram above. [1]

(b)



The diagram shows a universal set ℰ and the sets *X* and *Y*. Show, by means of two diagrams, that the set $(X \cup Y)'$ is not the same as the set $X' \cup Y'$. [2]

2 Find the equation of the normal to the curve $y = \dfrac{2x+4}{x-2}$ at the point where $x = 4$. [5]

3 The straight line $3x = 2y + 18$ intersects the curve $2x^2 - 23x + 2y + 50 = 0$ at the points *A* and *B*. Given that *A* lies below the *x*-axis and that the point *P* lies on *AB* such that $AP : PB = 1 : 2$, find the coordinates of *P*. [6]

4 **(i)** Find the first three terms, in ascending powers of *u*, in the expansion of $(2 + u)^5$. [2]

(ii) By replacing *u* with $2x - 5x^2$, find the coefficient of x^2 in the expansion of $(2 + 2x - 5x^2)^5$. [4]

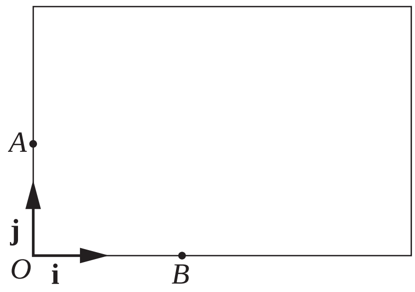
5 A curve has the equation $y = \sqrt{x} + \dfrac{9}{\sqrt{x}}$.

(i) Find expressions for $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$.

(ii) Show that the curve has a stationary value when $x = 9$. [1]

(iii) Find the nature of this stationary value. [2]

6



The diagram shows a large rectangular television screen in which one corner is taken as the origin O and $\mathbf{i}$ and $\mathbf{j}$ are unit vectors along two of the edges. In a game, an alien spacecraft appears at the point A with position vector $12\mathbf{j}$ cm and moves across the screen with velocity $(40\mathbf{i} + 15\mathbf{j})$ cm per second. A player fires a missile from a point B; the missile is fired 0.5 seconds after the spacecraft appears on the screen. The point B has position vector $46\mathbf{i}$ cm and the velocity of the missile is $(k\mathbf{i} + 30\mathbf{j})$ cm per second, where k is a constant. Given that the missile hits the spacecraft,

(i) show that the spacecraft moved across the screen for 1.8 seconds before impact, [4]

(ii) find the value of k. [3]

7 **(a)** Use the substitution $u = 5^x$ to solve the equation $5^{x+1} = 8 + 4(5^{-x})$. [5]

(b) Given that $\log(p - q) = \log p - \log q$, express p in terms of q. [3]

8 **(a)** Solve, for $0 \leqslant x \leqslant 2$, the equation $1 + 5\cos 3x = 0$, giving your answer in radians correct to 2 decimal places. [3]

(b) Find all the angles between 0° and 360° such that

$$\sec y + 5\tan y = 3\cos y.$$ [5]

9

x	0.100	0.125	0.160	0.200	0.400
y	0.050	0.064	0.085	0.111	0.286

The table above shows experimental values of the variables x and y.

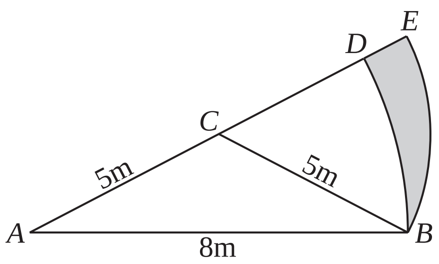
(i) On graph paper draw the graph of $\frac{1}{y}$ against $\frac{1}{x}$. [3]

Hence,

(ii) express y in terms of x, [4]

(iii) find the value of x for which $y = 0.15$. [2]

10



The diagram shows an isosceles triangle ABC in which $AB = 8$ m, $BC = CA = 5$ m. $ABDA$ is a sector of the circle, centre A and radius 8 m. $CBEC$ is a sector of the circle, centre C and radius 5 m.

(i) Show that angle BCE is 1.287 radians correct to 3 decimal places. [2]

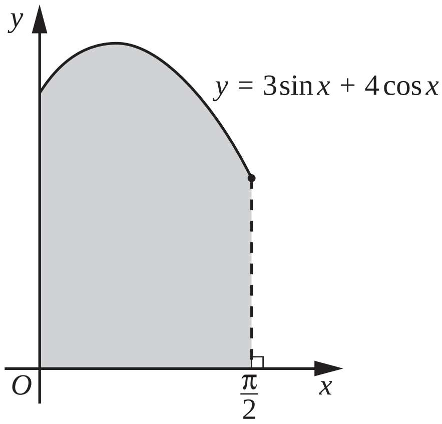
(ii) Find the perimeter of the shaded region. [4]

(iii) Find the area of the shaded region. [4]

[Question 11 is printed on the next page.]

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

EITHER

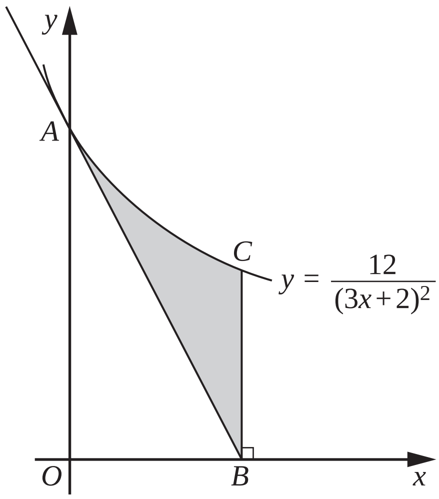


The graph shows part of the curve $y = 3\sin x + 4\cos x$ for $0 \leqslant x \leqslant \frac{\pi}{2}$ radians.

(i) Find the coordinates of the maximum point of the curve. [5]

(ii) Find the area of the shaded region. [5]

OR



The diagram, which is not drawn to scale, shows part of the curve $y = \frac{12}{(3x+2)^2}$, intersecting the y-axis at A. The tangent to the curve at A meets the x-axis at B. The point C lies on the curve and BC is parallel to the y-axis.

(i) Find the x-coordinate of B. [4]

(ii) Find the area of the shaded region. [6]

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