Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

ADDITIONAL MATHEMATICS **0606/22**

Paper 2 **May/June 2017**

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 **12** 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

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

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

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

Formulae for ΔABC

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

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

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

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1 Solve $|5x + 3| = |1 - 3x|$. [3]

View solution

2 **Without using a calculator**, express $\left(\frac{1+\sqrt{5}}{3-\sqrt{5}}\right)^{-2}$ in the form $a + b\sqrt{5}$, where a and b are integers. [5]

View solution

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3 **Without using a calculator**, factorise the expression $10x^3 - 21x^2 + 4$. [5]

View solution

4 The point P lies on the curve $y = 3x^2 - 7x + 11$. The normal to the curve at P has equation $5y + x = k$. Find the coordinates of P and the value of k. [6]

View solution

5 **(i)** Show that $\frac{\mathrm{d}}{\mathrm{d}x}[0.4x^5(0.2 - \ln 5x)] = kx^4 \ln 5x$, where k is an integer to be found. [2]

View solution

(ii) Express $\ln 125x^3$ in terms of $\ln 5x$. [1]

View solution

(iii) Hence find $\int (x^4 \ln 125x^3)\,\mathrm{d}x$. [2]

View solution

6 Show that the roots of $px^2 + (p - q)x - q = 0$ are real for all real values of p and q. [4]

View solution

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7 **(a)** Given that $a^7 = b$, where a and b are positive constants, find,

(i) $\log_a b$, [1]

View solution

(ii) $\log_b a$. [1]

View solution

(b) Solve the equation $\log_{81} y = -\frac{1}{4}$. [2]

View solution

(c) Solve the equation $\frac{32^{x^2-1}}{4^{x^2}} = 16$. [3]

View solution

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

The points A and B are $(-8, 8)$ and $(4, 0)$ respectively.

(i) Find the equation of the line AB. [2]

View solution

(ii) Calculate the length of AB. [2]

View solution

The point C is $(0, 7)$ and D is the mid-point of AB.

(iii) Show that angle ADC is a right angle. [3]

View solution

The point E is such that $\overrightarrow{AE} = \begin{pmatrix} 4 \\ -7 \end{pmatrix}$.

(iv) Write down the position vector of the point E. [1]

View solution

(v) Show that $ACBE$ is a parallelogram. [2]

View solution

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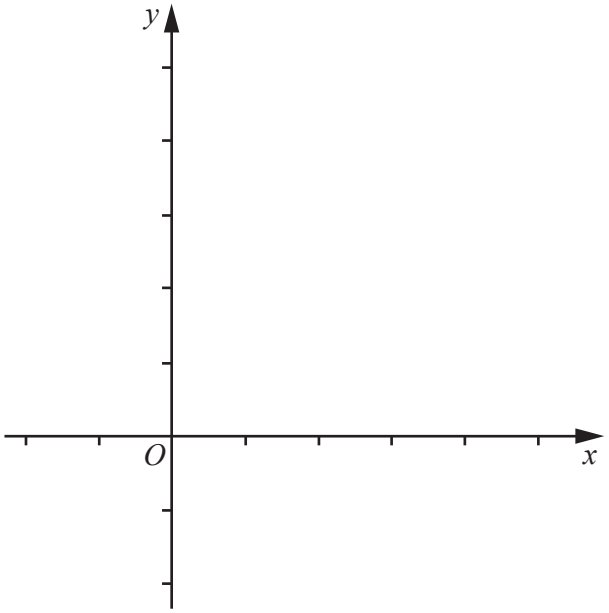
9 A function f is defined, for $x \leqslant \frac{3}{2}$, by $\mathrm{f}(x) = 2x^2 - 6x + 5$.

(i) Express $\mathrm{f}(x)$ in the form $a(x-b)^2 + c$, where a, b and c are constants. [3]

View solution

(ii) On the same axes, sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$, showing the geometrical relationship between them. [3]

View solution



(iii) Using your answer from part **(i)**, find an expression for $\mathrm{f}^{-1}(x)$, stating its domain. [3]

View solution

10 Solve the equation

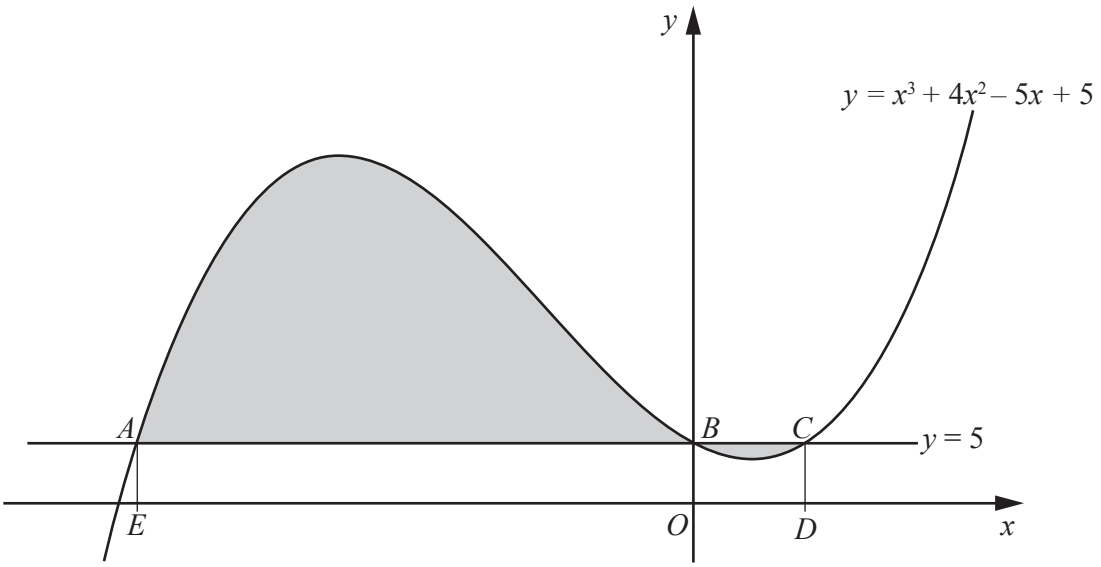
(i) $4\sin\left(3x-\frac{\pi}{4}\right)=3$ for $0\leqslant x\leqslant\frac{\pi}{2}$ radians, [4]

View solution

(ii) $2\tan^2 y+\sec^2 y=14\sec y+3$ for $0°\leqslant y\leqslant 360°$. [5]

View solution

11



The diagram shows part of the curve $y = x^3 + 4x^2 - 5x + 5$ and the line $y = 5$. The curve and the line intersect at the points A, B and C. The points D and E are on the x-axis and the lines AE and CD are parallel to the y-axis.

(i) Find $\int (x^3 + 4x^2 - 5x + 5)\,\mathrm{d}x$. [2]

View solution

(ii) Find the area of each of the rectangles $OEAB$ and $OBCD$. [4]

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(iii) Hence calculate the total area of the shaded regions enclosed between the line and the curve. You must show all your working. [4]

View solution

Question 12 is printed on the next page.

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12 The function g is defined, for $x > -\frac{1}{2}$, by $\mathrm{g}(x) = \frac{3}{2x+1}$.

(i) Show that $\mathrm{g}'(x)$ is always negative. [2]

View solution

(ii) Write down the range of g. [1]

View solution

The function h is defined, for all real x, by $\mathrm{h}(x) = kx + 3$, where k is a constant.

(iii) Find an expression for $\mathrm{hg}(x)$. [1]

View solution

(iv) Given that $\mathrm{hg}(0) = 5$, find the value of k. [2]

View solution

(v) State the domain of hg. [1]

View solution

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