PLATINUM
BUSINESS ACADEMY
0777898626

Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

3414314086

MATHEMATICS **9709/13**

Paper 1 Pure Mathematics 1 **(P1)** **October/November 2018**

1 hour 45 minutes

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.
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 in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
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 75.

This document consists of **20** printed pages.

© UCLES 2018

PLATINUM
BUSINESS ACADEMY
0777898626

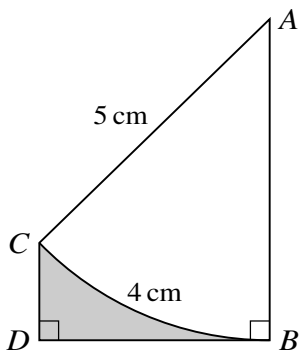
1 Find the coefficient of $\frac{1}{x^3}$ in the expansion of $\left(x - \frac{2}{x}\right)^7$. [3]

PLATINUM BUSINESS ACADEMY
0777898626

2 The function f is defined by $f(x) = x^3 + 2x^2 - 4x + 7$ for $x \geqslant -2$. Determine, showing all necessary working, whether f is an increasing function, a decreasing function or neither. [4]

PLATINUM
BUSINESS ACADEMY
0777898626

3



The diagram shows an arc BC of a circle with centre A and radius 5 cm. The length of the arc BC is 4 cm. The point D is such that the line BD is perpendicular to BA and DC is parallel to BA.

(i) Find angle BAC in radians. [1]

.....

.....

.....

.....

.....

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

PLATINUM
BUSINESS ACADEMY
0777898626

PLATINUM BUSINESS ACADEMY
0777898626

4 Two points A and B have coordinates $(-1, 1)$ and $(3, 4)$ respectively. The line BC is perpendicular to AB and intersects the x-axis at C.

(i) Find the equation of BC and the x-coordinate of C. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(ii) Find the distance AC, giving your answer correct to 3 decimal places. [2]

.....

.....

.....

.....

.....

.....

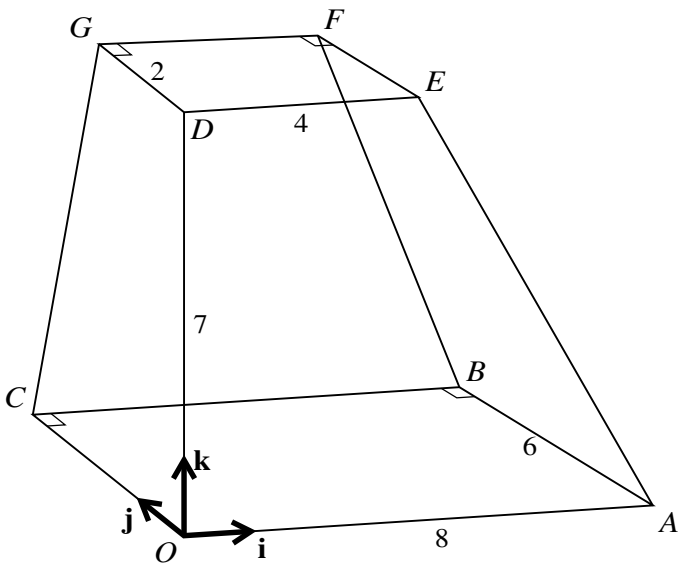
.....

PLATINUM
BUSINESS ACADEMY
0777898626

5 In an arithmetic progression the first term is a and the common difference is 3. The nth term is 94 and the sum of the first n terms is 1420. Find n and a. [6]

PLATINUM BUSINESS ACADEMY
0777898626

6



The diagram shows a solid figure $OABCDEFG$ with a horizontal rectangular base $OABC$ in which $OA = 8$ units and $AB = 6$ units. The rectangle $DEFG$ lies in a horizontal plane and is such that D is 7 units vertically above O and DE is parallel to OA. The sides DE and DG have lengths 4 units and 2 units respectively. Unit vectors $\mathbf{i}$, $\mathbf{j}$ and $\mathbf{k}$ are parallel to OA, OC and OD respectively. Use a scalar product to find angle OBF, giving your answer in the form $\cos^{-1}\left(\frac{a}{b}\right)$, where a and b are integers.

[6]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

PLATINUM
BUSINESS ACADEMY
0777898626

PLATINUM
BUSINESS ACADEMY
0777898626

7 **(i)** Show that $\dfrac{\tan\theta + 1}{1 + \cos\theta} + \dfrac{\tan\theta - 1}{1 - \cos\theta} \equiv \dfrac{2(\tan\theta - \cos\theta)}{\sin^2\theta}$. [3]

PLATINUM
BUSINESS ACADEMY
0777898626

(ii) Hence, showing all necessary working, solve the equation

$$\frac{\tan\theta + 1}{1 + \cos\theta} + \frac{\tan\theta - 1}{1 - \cos\theta} = 0$$

for $0° < \theta < 90°$. [4]

PLATINUM
BUSINESS ACADEMY
0777898626

8 A curve passes through (0, 11) and has an equation for which $\frac{dy}{dx} = ax^2 + bx - 4$, where a and b are constants.

(i) Find the equation of the curve in terms of a and b. [3]

PLATINUM
BUSINESS ACADEMY
0777898626

(ii) It is now given that the curve has a stationary point at (2, 3). Find the values of a and b. [3]

PLATINUM BUSINESS ACADEMY
0777898626

9 A curve has equation $y = 2x^2 - 3x + 1$ and a line has equation $y = kx + k^2$, where k is a constant.

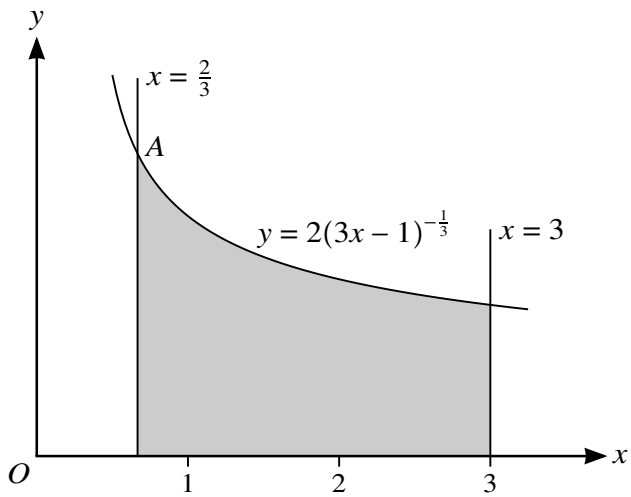
(i) Show that, for all values of k, the curve and the line meet. [4]

PLATINUM
BUSINESS ACADEMY
0777898626

(ii) State the value of k for which the line is a tangent to the curve and find the coordinates of the point where the line touches the curve. [4]

PLATINUM BUSINESS ACADEMY
0777898626

10



The diagram shows part of the curve $y = 2(3x - 1)^{-\frac{1}{3}}$ and the lines $x = \frac{2}{3}$ and $x = 3$. The curve and the line $x = \frac{2}{3}$ intersect at the point A.

(i) Find, showing all necessary working, the volume obtained when the shaded region is rotated through 360° about the x-axis. [5]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

PLATINUM
BUSINESS ACADEMY
0777898626

(ii) Find the equation of the normal to the curve at A, giving your answer in the form $y = mx + c$. [5]

PLATINUM BUSINESS ACADEMY
0777898626

11 **(i)** Express $2x^2 - 12x + 11$ in the form $a(x+b)^2 + c$, where a, b and c are constants. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

The function f is defined by $f(x) = 2x^2 - 12x + 11$ for $x \leqslant k$.

(ii) State the largest value of the constant k for which f is a one-one function. [1]

.....

.....

.....

(iii) For this value of k find an expression for $f^{-1}(x)$ and state the domain of f^{-1}. [4]

.....

.....

.....

.....

.....

.....

.....

PLATINUM
BUSINESS ACADEMY
0777898626

.....

.....

.....

.....

.....

.....

.....

The function g is defined by $g(x) = x + 3$ for $x \leqslant p$.

(iv) With k now taking the value 1, find the largest value of the constant p which allows the composite function fg to be formed, and find an expression for $fg(x)$ whenever this composite function exists. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

PLATINUM
BUSINESS ACADEMY
0777898626

Additional Page

If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

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 2018