

Write your name here

Surname

Other names

Pearson
Edexcel GCE

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

Core Mathematics C3

Advanced

Tuesday 19 June 2018 – Afternoon

Time: 1 hour 30 minutes

Paper Reference

6665/01**You must have:**

Mathematical Formulae and Statistical Tables (Pink)

Total Marks

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B). Coloured pencils and highlighter pens must not be used.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P51520A

©2018 Pearson Education Ltd.

1/1/1/1/1/



Pearson

Leave
blank

1. Given $y = 2x(3x - 1)^5$,

(a) find $\frac{dy}{dx}$, giving your answer as a single fully factorised expression. (4)

(b) Hence find the set of values of x for which $\frac{dy}{dx} \leq 0$ (2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 1 continued

Handwriting practice area with horizontal lines.

(Total 6 marks)

Q1

Mark box



P 5 1 5 2 0 A 0 3 3 6

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

$$f(x) = \frac{6}{2x+5} + \frac{2}{2x-5} + \frac{60}{4x^2-25}, \quad x > 4$$

(a) Show that $f(x) = \frac{A}{Bx + C}$ where A, B and C are constants to be found. (4)

(b) Find $f^{-1}(x)$ and state its domain. (3)



Leave
blank

Question 2 continued

Lined area for writing answers.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 2 continued

Handwriting practice area with horizontal lines.

(Total 7 marks)

Q2

Mark box



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Leave
blank

Question 3 continued

Lined area for writing the answer to Question 3.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 3 continued

Handwriting practice area with horizontal lines.

(Total 9 marks)

Q3

Mark box for Q3

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

4.

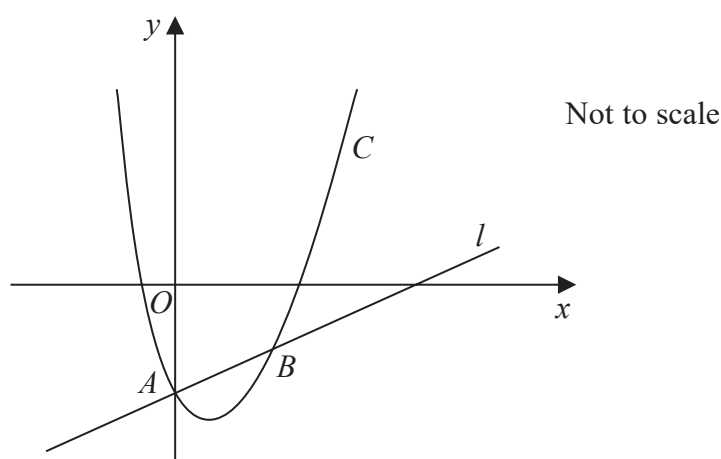


Figure 1

Figure 1 shows a sketch of part of the curve C with equation

$$y = e^{-2x} + x^2 - 3$$

The curve C crosses the y -axis at the point A .

The line l is the normal to C at the point A .

- (a) Find the equation of l , writing your answer in the form $y = mx + c$, where m and c are constants.

(5)

The line l meets C again at the point B , as shown in Figure 1.

- (b) Show that the x coordinate of B is a solution of

$$x = \sqrt{1 + \frac{1}{2}x - e^{-2x}}$$

(2)

Using the iterative formula

$$x_{n+1} = \sqrt{1 + \frac{1}{2}x_n - e^{-2x_n}}$$

with $x_1 = 1$

- (c) find x_2 and x_3 to 3 decimal places.

(2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 4 continued

Lined area for writing the answer to Question 4.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 5 1 5 2 0 A 0 1 3 3 6

Leave
blank

Question 4 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 4 continued

Handwriting practice area with horizontal lines.

(Total 9 marks)

Q4



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

A Cartesian coordinate system with a horizontal x -axis and a vertical y -axis. The origin is labeled O . A piecewise linear function $y = f(x)$ is plotted. The function consists of two line segments: one with a negative slope starting from a point on the y -axis and ending at a minimum point in the fourth quadrant, and another with a positive slope starting from that minimum point and extending upwards and to the right. The label $y = f(x)$ is placed near the upper right segment of the graph.

Figure 2

Figure 2 shows part of the graph with equation $y = f(x)$, where

$$f(x) = 2|5 - x| + 3, \quad x \geq 0$$

Given that the equation $f(x) = k$, where k is a constant, has exactly one root,

- (a) state the set of possible values of k . (2)

- (b) Solve the equation $f(x) = \frac{1}{2}x + 10$
- (4)**

The graph with equation $y = f(x)$ is transformed onto the graph with equation $y = 4f(x - 1)$. The vertex on the graph with equation $y = 4f(x - 1)$ has coordinates (p, q) .

- (c) State the value of p and the value of q . (2)

Leave
blank

Question 5 continued

Lined area for writing the answer to Question 5.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 5 continued

Lined area for writing answers to Question 5.

(Total 8 marks)

Q5

Box for marking Q5.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

Leave
blank

Question 6 continued

Lined area for writing the answer to Question 6.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 5 1 5 2 0 A 0 2 1 3 6

Leave
blank

Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 6 continued

Q6

(Total 11 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Leave
blank

7. The curve C has equation $y = \frac{\ln(x^2 + 1)}{x^2 + 1}$, $x \in \mathbb{R}$

(a) Find $\frac{dy}{dx}$ as a single fraction, simplifying your answer.

(3)

(b) Hence find the exact coordinates of the stationary points of C .

(6)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 7 continued

Lined area for writing the answer to Question 7.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 5 1 5 2 0 A 0 2 5 3 6

Leave
blank

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 7 continued

Handwriting practice area with horizontal lines.

(Total 9 marks)

Q7

Mark box



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Leave
blank

8. (a) By writing $\sec \theta = \frac{1}{\cos \theta}$, show that $\frac{d}{d\theta}(\sec \theta) = \sec \theta \tan \theta$ (2)

(b) Given that

$$x = e^{\sec y} \quad x > e, \quad 0 < y < \frac{\pi}{2}$$

show that

$$\frac{dy}{dx} = \frac{1}{x\sqrt{g(x)}}, \quad x > e$$

where $g(x)$ is a function of $\ln x$. (5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 8 continued

Lined area for writing the answer to Question 8.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 5 1 5 2 0 A 0 2 9 3 6

Leave
blank

Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 8 continued

Handwriting practice area with horizontal lines.

(Total 7 marks)

Q8

Mark box

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 5 1 5 2 0 A 0 3 1 3 6

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- Give the exact value of R and the value of α , in radians, to 3 decimal places.

$$M(\theta) = 40 + (3\sin\theta - 6\cos\theta)^2$$

- (i) the maximum value of $M(\theta)$,

- (ii) the smallest value of θ , in the range $0 < \theta \leq 2\pi$, at which the maximum value of $M(\theta)$ occurs.

$$N(\theta) = \frac{30}{5 + 2(\sin 2\theta - 2\cos 2\theta)^2}$$

- (i) the maximum value of $N(\theta)$,

- (ii) the largest value of θ , in the range $0 < \theta \leq 2\pi$, at which the maximum value of $N(\theta)$ occurs.

(3)

(Solutions based entirely on graphical or numerical methods are not acceptable.)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Leave
blank

Question 9 continued

Handwriting practice area with 30 horizontal lines.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 9 continued

Lined area for writing the answer to Question 9.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 5 1 5 2 0 A 0 3 5 3 6

Leave
blank

Question 9 continued

Handwriting practice area with 25 horizontal lines.

(Total 9 marks)

Q9

TOTAL FOR PAPER: 75 MARKS

END

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

