

Write your name here

Surname	Other names
---------	-------------

Centre Number

--	--	--	--	--	--

Candidate Number

--	--	--	--

Edexcel
International GCSE

Further Pure Mathematics
Paper 2

Thursday 16 June 2016 – Afternoon Time: 2 hours	Paper Reference 4PM0/02
---	-----------------------------------

Calculators may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 100.
- 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.
- Check your answers if you have time at the end.

Turn over ►

P46902A

©2016 Pearson Education Ltd.

1/1/1/1



PEARSON

Question 1 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 1 is 5 marks)



2 Relative to a fixed origin O , the point A has position vector $6\mathbf{i} + 5\mathbf{j}$ and the point B has position vector $3\mathbf{i} + 9\mathbf{j}$

(a) Find \overrightarrow{AB} as a simplified vector in terms of \mathbf{i} and \mathbf{j} (2)

The line PQ is parallel to AB . Given that $\overrightarrow{PQ} = 12\mathbf{i} + \lambda\mathbf{j}$

(b) find the value of λ . (2)

(c) Find a unit vector parallel to AB . (2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with horizontal dotted lines.

(Total for Question 2 is 6 marks)



Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 25 horizontal dotted lines.



4 Differentiate with respect to x

$$e^{2x} \cos 3x$$

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing the answer.

(Total for Question 4 is 3 marks)



Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 5 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 5 is 10 marks)



- 6 (a) Use algebra to find the coordinates of the points of intersection of the curve with equation $y = x^2 + 2x - 6$ and the line with equation $y = 5x + 4$ (5)
- (b) Use algebraic integration to find the exact area of the finite region bounded by the curve and the line. (5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 6 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 6 is 10 marks)



- 7 A particle P moves in a straight line so that, at time t seconds ($t \geq 0$), its velocity, v m/s, is given by $v = 3t^2 - 4t + 7$

Find

- (a) the acceleration of P at time $t = 2$ (2)

- (b) the minimum speed of P . (3)

When $t = 0$, P is at the point A and has velocity V m/s.

- (c) Write down the value of V . (1)

When P reaches the point B , the velocity of P is also V m/s.

- (d) Find the distance AB . (6)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 7 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 7 is 12 marks)



8 A curve C has equation

$$y = \frac{3x^2 - 1}{3x + 2} \quad \text{where } x \neq -\frac{2}{3}$$

(a) Write down an equation of the asymptote to C which is parallel to the y -axis. (1)

(b) Find the coordinates of the stationary points on C . (8)

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

(c) Write down the coordinates of A . (1)

(d) On the axes on the opposite page, sketch C , showing clearly the asymptote parallel to the y -axis, the coordinates of the stationary points and the coordinates of A . (3)

The line l is the normal to the curve at A .

(e) Find an equation of l . (3)

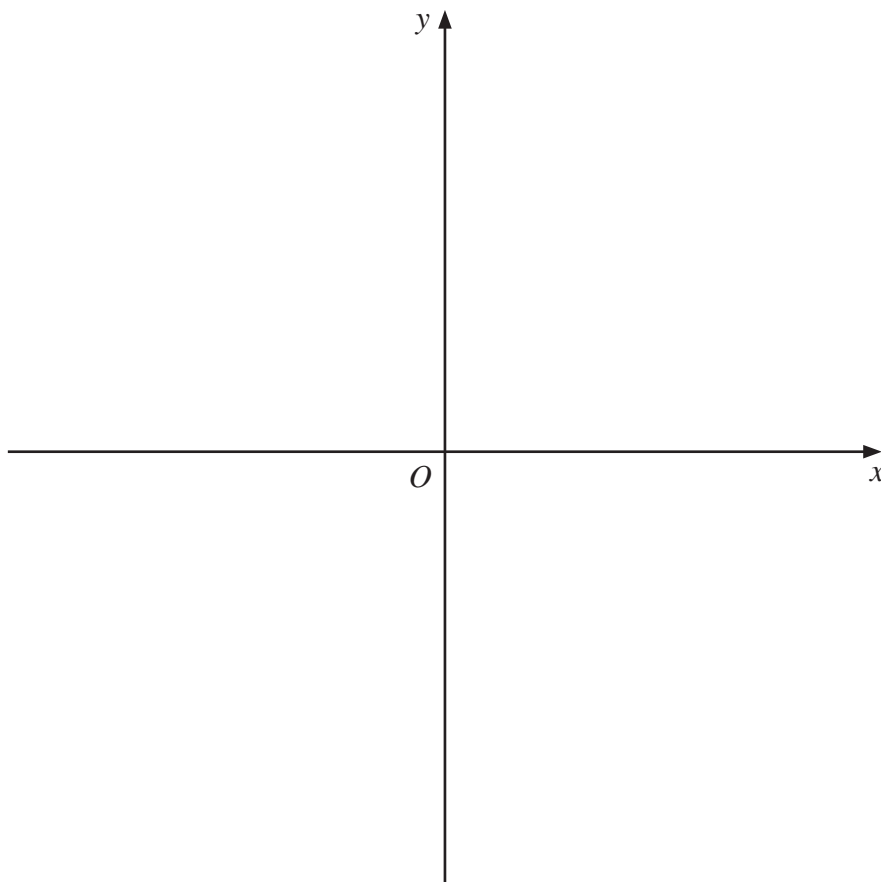
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 8 continued



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 8 continued

Handwriting practice area with 25 horizontal dotted lines.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 8 is 16 marks)



9

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

Using the above identities

(a) show that $\cos 2\theta = 2 \cos^2 \theta - 1$ (3)

(b) find a simplified expression for $\sin 2\theta$ in terms of $\sin \theta$ and $\cos \theta$ (1)

(c) show that $\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$ (4)

Hence, or otherwise,

(d) solve, for $0 \leq \theta < \pi$ giving your answers in terms of π , the equation

$$6 \cos \theta - 8 \cos^3 \theta + 1 = 0$$
 (4)

(e) find

(i) $\int (8 \cos^3 \theta + 4 \sin \theta) d\theta$

(ii) the exact value of $\int_0^{\frac{\pi}{3}} (8 \cos^3 \theta + 4 \sin \theta) d\theta$ (4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 9 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 9 is 16 marks)



Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 10 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 10 is 12 marks)

TOTAL FOR PAPER IS 100 MARKS

