

Write your name here

Surname

Other names

Edexcel

International GCSE

Centre Number

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Candidate Number

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Further Pure Mathematics

Paper 1

Thursday 17 January 2013 – Morning

Time: 2 hours

Paper Reference

4PM0/01

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 ►

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PEARSON

Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 (a) On the axes below sketch the lines with equations

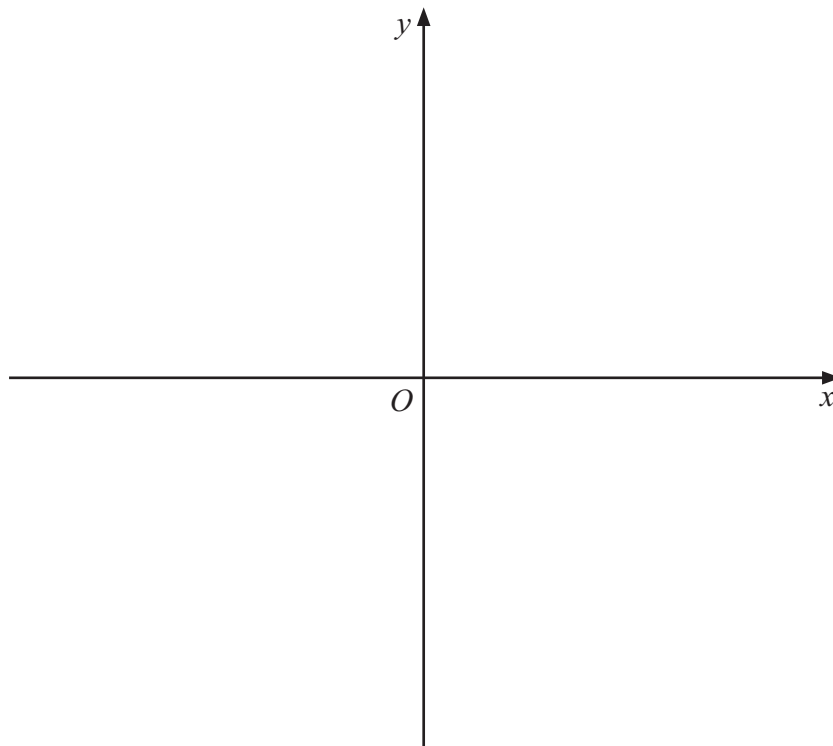
(i) $y = 8$ (ii) $y + x = 6$ (iii) $y = 3x - 4$

Show the coordinates of the points where each line crosses the coordinate axes.

(3)

(b) Show, by shading, the region R which satisfies $y \geq 3x - 4$, $y + x \geq 6$, $x \geq 0$ and $y \leq 8$

(1)



(Total for Question 1 is 4 marks)



Question 3 continued

A series of horizontal dotted lines for writing.

(Total for Question 3 is 5 marks)



4 (a) Show that $\sum_{r=1}^n (3r - 4) = \frac{n}{2}(3n - 5)$ (3)

(b) Hence, or otherwise, evaluate $\sum_{r=11}^{50} (3r - 4)$ (2)

Given that $\sum_{r=1}^n (3r - 4) = 186$

(c) find the value of n . (3)

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Question 4 continued

Lined writing area with horizontal dotted lines for student responses.

(Total for Question 4 is 8 marks)



5 A particle P moves along the x -axis. At time t seconds ($t \geq 0$) the velocity, v m/s, of P is given by $v = 5 \cos 2t$. Find

(a) the least value of t for which P is instantaneously at rest, (2)

(b) the magnitude of the maximum acceleration of P . (3)

When $t = 0$, P is at the point $(2, 0)$.

(c) Find the distance of P from the origin when P first comes to instantaneous rest. (4)

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Question 5 continued

Dotted lines for writing.

(Total for Question 5 is 9 marks)



6

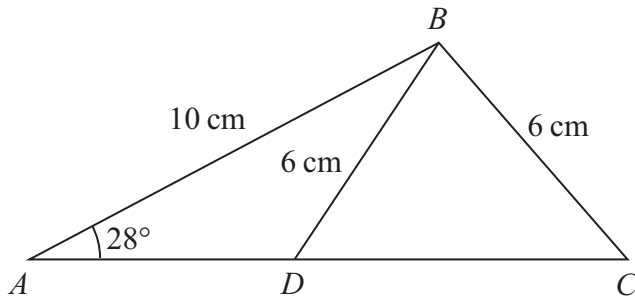


Diagram NOT accurately drawn

Figure 1

Figure 1 shows triangle ABC with $AB = 10$ cm, $BC = 6$ cm and $\angle BAC = 28^\circ$. The point D lies on AC such that $BD = 6$ cm.

- (a) Find, to the nearest 0.1° , the size of $\angle DBC$. (4)
- (b) Find, to 3 significant figures, the length of AD . (3)
- (c) Find, to 3 significant figures, the area of triangle ABC . (3)



Question 6 continued

Dotted lines for writing.

(Total for Question 6 is 10 marks)



P 4 2 0 3 8 A 0 1 1 3 2

7 The point C with coordinates $(2, 1)$ is the centre of a circle which passes through the point A with coordinates $(3, 3)$.

(a) Find the radius of the circle. (2)

The line AB is a diameter of the circle.

(b) Find the coordinates of B . (2)

The points D with coordinates $(0, 2)$ and E with coordinates $(4, 0)$ lie on the circle.

(c) Show that DE is a diameter of the circle. (2)

The point P has coordinates (x, y) .

(d) Find an expression, in terms of x and y , for the length of CP . (2)

Given that the point P lies on the circle,

(e) show that $x^2 + y^2 - 4x - 2y = 0$ (2)



Question 7 continued

Ruled writing area consisting of multiple horizontal dotted lines for text entry.



Question 7 continued

A series of horizontal dotted lines for writing.



Question 7 continued

A series of horizontal dotted lines for writing the answer to Question 7.

(Total for Question 7 is 10 marks)



8 Solve, for $0 \leq \theta \leq \pi$, giving each solution to 3 significant figures,

(a) $5 \sin \theta - 1 = 0$

(3)

(b) $\tan\left(2\theta + \frac{\pi}{3}\right) = 0.4$

(4)

(c) $4 \sin^2 \theta - 7 \cos \theta = 2$

(4)

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Question 8 continued

Dotted lines for writing.



9 The sum S_n of the first n terms of an arithmetic series is given by $S_n = n(2n + 3)$. The first term of the series is a .

(a) Show that $a = 5$ (2)

(b) Find the common difference of the series. (3)

(c) Find the 12th term of the series. (2)

Given that $1 + S_{p+4} = 2S_p$

(d) find the value of p . (4)

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Question 9 continued

A series of horizontal dotted lines for writing.



Question 9 continued

A series of horizontal dotted lines for writing.



10

$$f(x) = 2x^2 - 5x + 1$$

The equation $f(x) = 0$ has roots α and β . Without solving the equation

(a) find the value of $\alpha^2 + \beta^2$ (3)

(b) show that $\alpha^4 + \beta^4 = \frac{433}{16}$ (2)

(c) form a quadratic equation with integer coefficients which has roots

$$\left(\alpha^2 + \frac{1}{\alpha^2}\right) \text{ and } \left(\beta^2 + \frac{1}{\beta^2}\right) \quad (7)$$



Question 10 continued

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Question 10 continued

A series of horizontal dotted lines for writing.



Question 10 continued

Dotted lines for writing the answer.

(Total for Question 10 is 12 marks)



11

$$f(x) = x^3 + px^2 + qx + 6 \quad p, q \in \mathbb{Z}$$

Given that $f(x) = (x - 1)(x - 3)(x + r)$

(a) find the value of r .

(1)

Hence, or otherwise,

(b) find the value of p and the value of q .

(3)

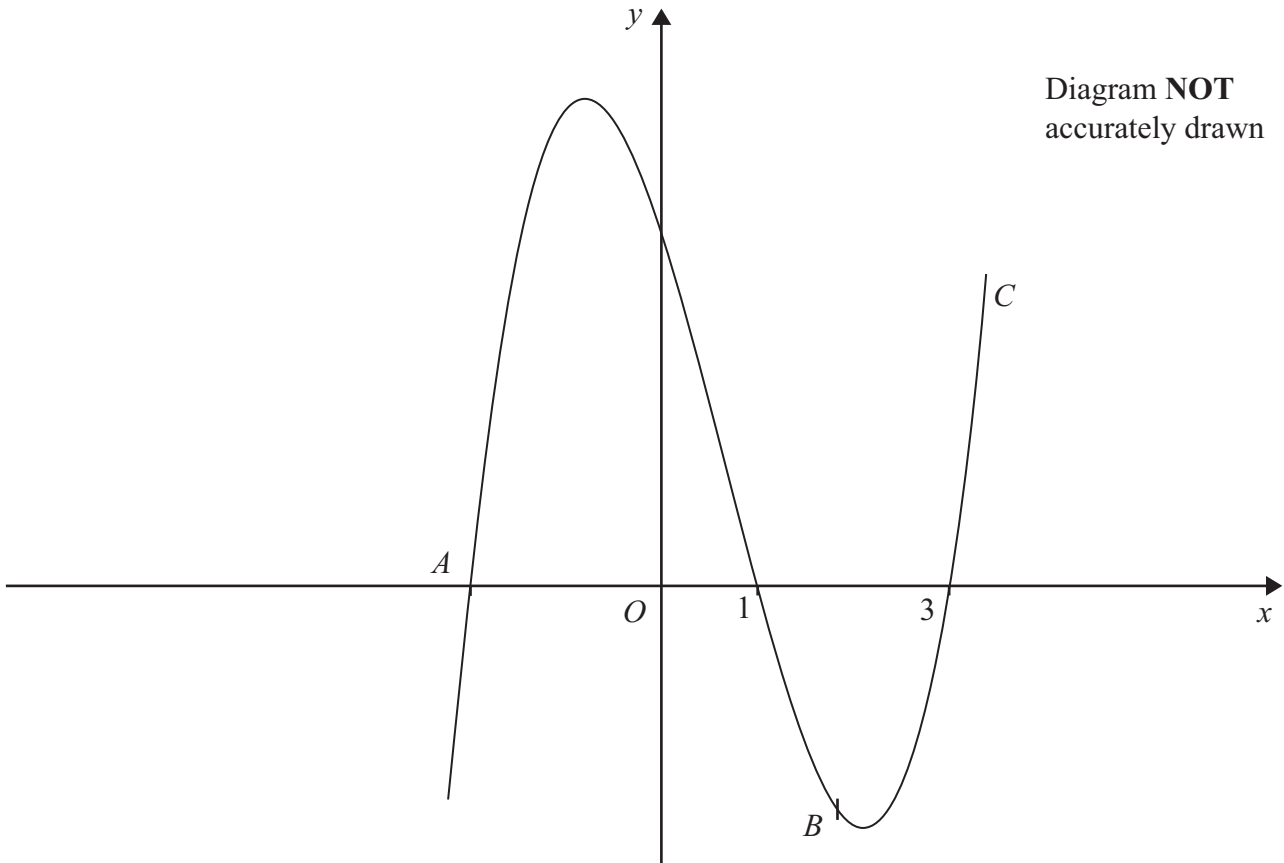


Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows the curve C with equation $y = f(x)$ which crosses the x -axis at the points with coordinates $(3, 0)$ and $(1, 0)$ and at the point A . The point B on C has x -coordinate 2

(c) Find an equation of the tangent to C at B .

(5)

(d) Show that the tangent at B passes through A .

(2)

(e) Use calculus to find the area of the finite region bounded by C and the tangent at B .

(5)

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Question 11 continued

A series of horizontal dotted lines for writing the answer to Question 11.



Question 11 continued

A series of horizontal dotted lines for writing.



Question 11 continued

Area containing horizontal dotted lines for writing.



