



**MATHEMATICS
 STANDARD LEVEL
 PAPER 2**

Thursday 6 May 2010 (morning)

1 hour 30 minutes

Candidate session number

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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- A graphic display calculator is required for this paper.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer all of Section B on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the number of sheets used in the appropriate box on your cover sheet.
- Unless otherwise stated in the question, all numerical answers must be given exactly or correct to three significant figures.

3. [Maximum mark: 7]

Let $f(x) = x \cos x$, for $0 \leq x \leq 6$.

(a) Find $f'(x)$.

[3 marks]

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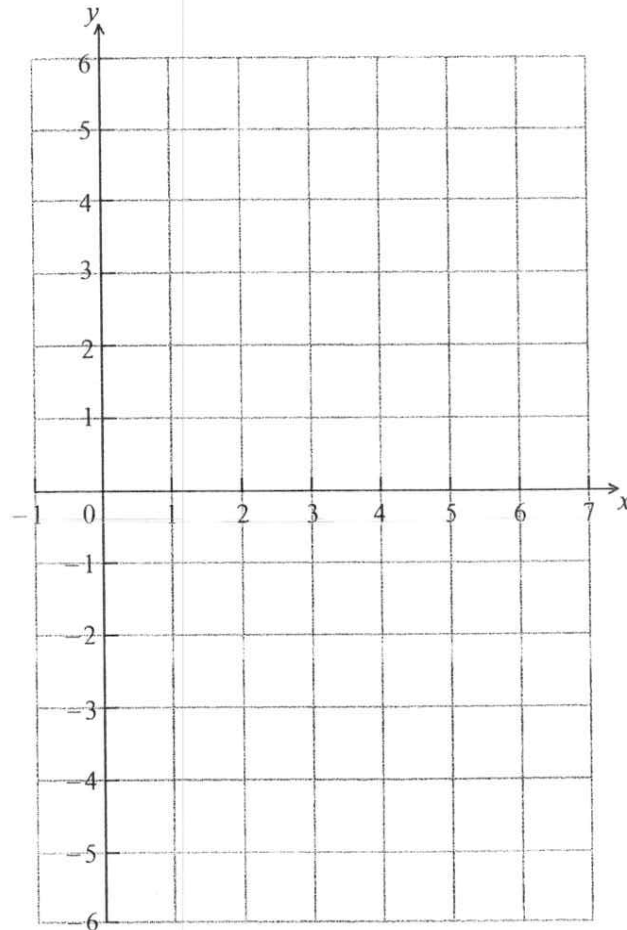
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(b) On the grid below, sketch the graph of $y = f'(x)$.

[4 marks]



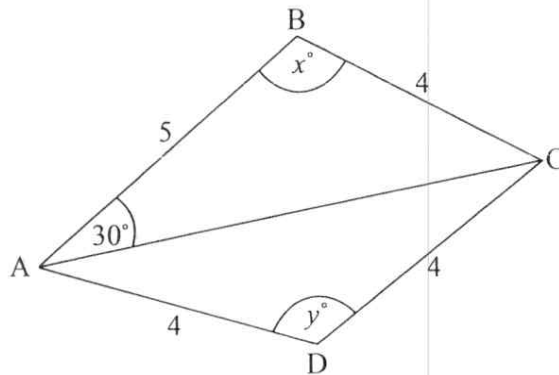
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SECTION B

Answer **all** the questions on the answer sheets provided. Please start each question on a new page.

8. [Maximum mark: 14]

The diagram below shows a quadrilateral ABCD with obtuse angles $\hat{A}BC$ and $\hat{A}DC$.



*diagram
not to scale*

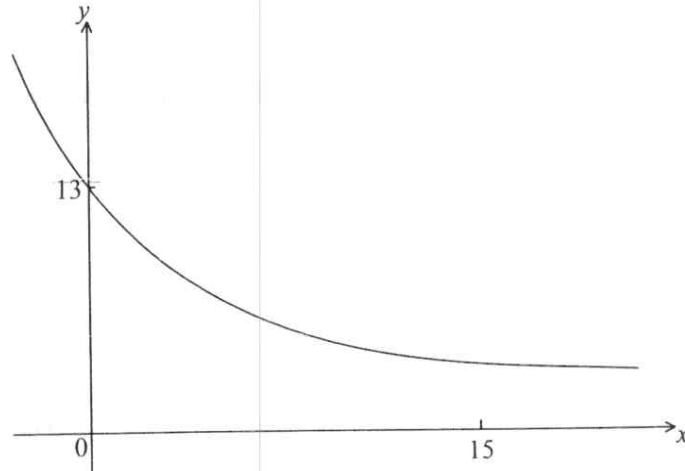
$AB = 5 \text{ cm}$, $BC = 4 \text{ cm}$, $CD = 4 \text{ cm}$, $AD = 4 \text{ cm}$, $\hat{B}AC = 30^\circ$, $\hat{A}BC = x^\circ$, $\hat{A}DC = y^\circ$.

- (a) Use the cosine rule to show that $AC = \sqrt{41 - 40 \cos x}$. [1 mark]
- (b) Use the sine rule in triangle ABC to find another expression for AC. [2 marks]
- (c) (i) Hence, find x , giving your answer to two decimal places.
(ii) Find AC. [6 marks]
- (d) (i) Find y .
(ii) Hence, or otherwise, find the area of triangle ACD. [5 marks]

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9. [Maximum mark: 16]

Let $f(x) = Ae^{kx} + 3$. Part of the graph of f is shown below.



The y -intercept is at $(0, 13)$.

- (a) Show that $A = 10$. [2 marks]
- (b) Given that $f(15) = 3.49$ (correct to 3 significant figures), find the value of k . [3 marks]
- (c) (i) Using your value of k , find $f'(x)$.
 (ii) Hence, explain why f is a decreasing function.
 (iii) Write down the equation of the horizontal asymptote of the graph f . [5 marks]

Let $g(x) = -x^2 + 12x - 24$.

- (d) Find the area enclosed by the graphs of f and g . [6 marks]

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10. [Maximum mark: 15]

The weights of players in a sports league are normally distributed with a mean of 76 kg. It is known that 80 % of the players have weights between 68 kg and 82 kg. The probability that a player weighs less than 68 kg is 0.05.

(a) Find the probability that a player weighs more than 82 kg. [2 marks]

(b) (i) Write down the standardized value, z , for 68 kg.

(ii) Hence, find the standard deviation of weights. [4 marks]

To take part in a tournament, a player's weight must be within 1.5 standard deviations of the mean.

(c) (i) Find the set of all possible weights of players that take part in the tournament.

(ii) A player is selected at random. Find the probability that the player takes part in the tournament. [5 marks]

Of the players in the league, 25 % are women. Of the women, 70 % take part in the tournament.

(d) Given that a player selected at random takes part in the tournament, find the probability that the selected player is a woman. [4 marks]
