

**MATHEMATICS
SPECIALIST
MAS3C_D**

**Section One
(calculator-free)**

Please place your student identification
label in this box

Student Number: In figures

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In words

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Time allowed for this paper

Section One

Reading time before commencing work: Five minutes
Working time for paper: 40 minutes

Materials required/recommended for this paper

To be provided by the supervisor

Question/answer booklet for Section One and a formula sheet which may also be used for Section Two.

To be provided by the candidate

Section One:

Standard Items: Pens, pencils, eraser or correction fluid, ruler, highlighter

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the

examination room. If you have any unauthorised material with you hand it to the supervisor **before** reading further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available
Section One: Calculator-free	6	6	40	35
Section Two: Calculator-assumed	11	11	80	65
Total				100

Instructions to candidates

1. Write your answers in the spaces provided in this Question/Answer Booklet. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
 - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
 - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.
2. **Show all your working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.
3. It is recommended that you **do not use pencil**, except in diagrams.

Section One: Calculator-free

(35 Marks)

This section has **six (6)** questions. Answer **all** questions. Write your answers in the space provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Working time: 40 minutes.

Question 1

(4 marks)

The graphs of $r = 5$, $\theta = \frac{\pi}{3}$ and $r = \frac{5}{\pi}\theta$ for $0 \leq \theta \leq 2\pi$ are drawn below

(a) Write down the polar coordinates of

(i) Point A

(1 mark)

(1 mark)

(ii) Point B

B₀

o A

(1 mark)

(1)

(b) Find the EXACT distance between A and B.

(2 marks)

(1 mark)

Question 2

(7 marks)

Determine $\frac{dy}{dx}$ for each of the following. Do not simplify your answers

(a) $y = \ln\left(\frac{1}{1-x^2}\right)$

(2 marks)

See next page

(b) $y = x^3 \sin^2(5x)$

(2 marks)

(c) $\log x^y = 3x$

(3 marks)

Question 3**(7 marks)**

Determine the following indefinite integrals.

(a) $\int 12e^{2x}(1 - e^{2x}) dx$

(2 marks)

(b) $\int \sin x (1 - \sin x) dx$

(3 marks)

(c) $\int \frac{6x^2 - 12}{x^3 - 6x + 3} dx$

(2 marks)

Question 4**(7 marks)**

- (a) Find the exact value of the definite integral below:

$$\int_0^3 \frac{x}{\sqrt{16-x^2}} dx$$

Use the substitution

$$u = 16 - x^2$$

(4 marks)

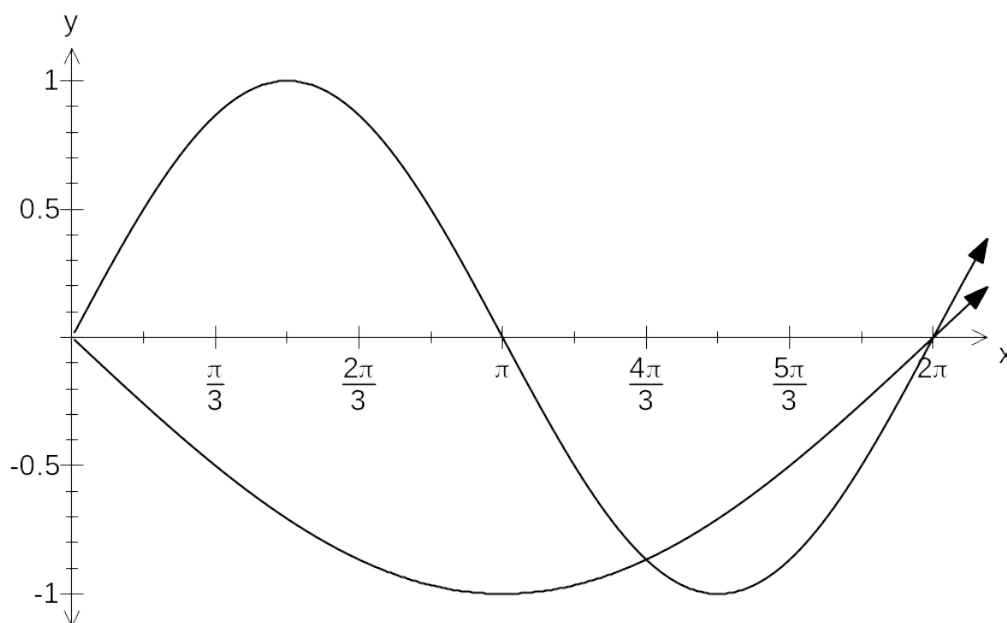
- (b) Show that $5^{(2 + \log_5 3)} = 75$

(3 marks)

Question 5

(4 marks)

Determine the area bounded by the curves $f(x) = \sin x$ and $g(x) = -\sin\left(\frac{x}{2}\right)$ for $0 \leq x \leq 2\pi$.



Question 6

(6 marks)

- (a) Find $\frac{d}{dx}(x \cos x)$, showing full working. (2 marks)

- (b) **Hence**, evaluate the following definite integrals, giving exact values.

(i) $\int_0^{\pi} \cos x - x \sin x \, dx$ (2 marks)

(1 mark)

(ii) $\int_0^{\pi} x \sin x \, dx$ (2 marks)

(1 mark)

End of questions

Additional working space

Question number: _____

Additional working space

Question number: _____

Additional working space

Question number: _____

Additional working space

Question number: _____