

Carine Senior High School

Year 12 Semester Two Examination, 2023

Question/Answer booklet

MATHEMATICS  
SPECIALIST  
UNITS 3&4

If required by your examination administrator, please place your student identification label in this box

Section One:  
Calculator-free

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| WA student number: In figures |  |  |  |  |  |  |  |  |  |  |

In words

Your name

|  |  |
| --- | --- |
| Number of additional answer booklets used (if applicable): |  |

## Time allowed for this section

Reading time before commencing work: five minutes

Working time: fifty minutes

## Materials required/recommended for this section

***To be provided by the supervisor***

This Question/Answer booklet

Formula sheet

***To be provided by the candidate***

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,  
correction fluid/tape, eraser, ruler, highlighters

Special items: nil

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

## Structure of this paper

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Working time (minutes) | Marks available | Percentage of examination |
| Section One: Calculator-free | 7 | 7 | 50 | 48 | 35 |
| Section Two: Calculator-assumed | 12 | 12 | 100 | 90 | 65 |
|  | | |  | **Total** | 100 |

## Instructions to candidates

|  |  |  |
| --- | --- | --- |
| Markers use only | | |
| Question | Maximum | Mark |
| 1 | 6 |  |
| 2 | 6 |  |
| 3 | 7 |  |
| 4 | 8 |  |
| 5 | 7 |  |
| 6 | 8 |  |
| 7 | 6 |  |
| Section 1 Total | 48 |  |
| Weighted (×0.7292) | 35% |  |
| Section 2 Weighted | 65% |  |
| Total | 100% |  |

1. The rules for the conduct of examinations are detailed in the school handbook. Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in this Question/Answer booklet preferably using a blue/black pen.  
Do not use erasable or gel pens.

3. You must be careful to confine your answers to the specific question asked and to follow any instructions that are specific to a particular question.

4. 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 any question, ensure that you cancel the answer you do not wish to have marked.

5. It is recommended that you do not use pencil, except in diagrams.

6. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

7. The Formula sheet is not to be handed in with your Question/Answer booklet.

Section One: Calculator-free 35% (48 Marks)

This section has**seven** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 50 minutes.

Question 1 (6 marks)

Function is defined with domain by .

(a) Determine . (2 marks)

Function is defined with domain by .

(b) State the range of . (1 mark)

(c) Determine the range of . (3 marks)

Question 2 (6 marks)

(a) Determine when . (3 marks)

(b) Determine the slope of the curve with equation at the point .

(3 marks)

Question 3 (7 marks)

<EFOFEX>
id:fxd{7a6a0f69-1501-49c1-94f6-8175fbf3a95c}

FXData:
</EFOFEX>The diagram shows part of the curve  
with equation

Use integration and the substitution  
 to determine the shaded  
area in the first quadrant bounded by  
 and the curve.

Question 4 (8 marks)

The planes with equations and intersect at point .

(a) Determine the coordinates of point . (3 marks)

Points and have coordinates and respectively.

(b) Determine the vector equation of the straight line through points and in the  
form . (2 marks)

(c) Determine the Cartesian equation of the plane that contains point , point and the origin. (3 marks)

Question 5 (7 marks)

A small body moving in a straight line is initially at the origin . seconds later the body has displacement metres and velocity metres per second relative to so that .

(a) Determine the initial acceleration of the body. (2 marks)

(b) Determine the displacement of the body as a function of time. (3 marks)

(c) Determine the velocity of the body after seconds. (2 marks)

Question 6 (8 marks)

Let .

(a) Determine the three cube roots of . (3 marks)

(b) Consider the polynomial , where is a real constant.  
  
Given that , solve the equation . (5 marks)

Question 7 (6 marks)

<EFOFEX>
id:fxd{38367136-9c86-4a34-baa3-924658b028dc}

FXData:
</EFOFEX>The graph of is shown.

Determine the volume of the solid of revolution  
formed when the part of the curve between  
 and is rotated about the -axis.

Supplementary page

Question number: \_\_\_\_\_\_\_\_\_

Supplementary page

Question number: \_\_\_\_\_\_\_\_\_

Supplementary page

Question number: \_\_\_\_\_\_\_\_\_