



PERTH MODERN SCHOOL
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INDEPENDENT PUBLIC SCHOOL

Semester One Examination, 2022
Question/Answer booklet

MATHEMATICS METHODS

UNIT 3

Section Two:
Calculator-assumed

Your Name: _____

Your Teacher's Name: _____

Time allowed for this section

Reading time before commencing work: ten minutes
Working time: one hundred minutes

Materials required/recommended for this section

To be provided by the supervisor

This Question/Answer booklet

Formula sheet (retained from Section One)

To be provided by the candidate

Standard items: black or blue/black (preferred), pencils (including coloured), sharpener, correction

fluid tape, eraser, ruler, highlighters

Special items: drawing instruments, templates, notes on two unfolded sheets of A4 paper, and up to three calculators approved for use in this examination

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.

Question	Marks	Max	Question	Marks	Max
7	8	12	11	11	12
8	8	12	12	12	12
9	8	15	13	10	10
10	8	16	14	8	8
11	10	10	15	10	10
12	10	10	16	10	10

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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	6	6	50	53	35
Section Two: Calculator-assumed	10	10	100	100	65
Total					100

Additional working space

Question number: _____

Instructions to candidates

1. The rules for the conduct of the Western Australian Certificate of Education ATAR course examinations are detailed in the *Year 12 Information Handbook 2019*. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer booklet.
3. You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
4. Additional pages for the use of planning your answer to a question or continuing your answer to a question may be provided at the end of this Question/Answer booklet. If you use the space to continue an answer, indicate in the original answer space where the answer is continued; i.e. give the page number.
5. **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.
6. It is recommended that you **do not use pencil**, except in diagrams.
7. The Formula sheet is **not** to be handed in with your Question/Answer booklet.

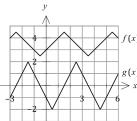
Section Two: Calculator-assumed (100 Marks)

This section has ten questions. Answer all questions. Write your answers in the spaces provided.
 Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space for working an answer.
 • 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 that you are continuing to answer at the top of the page.

Working time: 100 minutes.

**Question 7
marks**

The graphs of the continuous functions $y=f(x)$ and $y=g(x)$ are shown at right.



- (a) Evaluate the derivative of
- $f(g(x))$
- at
- $x=-2$
- .

(2 marks)

- (b) Evaluate the derivative of
- $|f(g(x))|$
- at
- $x=5$
- .

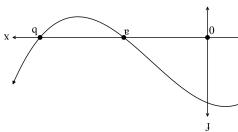
(3 marks)

- (c) Evaluate the derivative of
- $\frac{g'(x)}{f(x)}$
- at
- $x=0$
- .

(3 marks)

- (d) Determine the area bounded by the function, the
- x
- axis and
- $y=0$
- on the interval
- $[0, q]$
- . (2 marks)

- (e) Evaluate
- $\int f(x)dx$
- .
-
- Given
- $\int_0^1 f(x)dx = 5.4$
- and
- $\int_1^2 f(x)dx = 3.9$
- (2 marks)



- (f) Consider the graph below. (4 marks)

- (g) Using calculus to justify your answer, determine the minimum possible surface area of the prism and the value of
- x
- for which it occurs.

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Question 8

(15 marks)

The profit function, $P(x)$ in \$, of a company producing x items, is given by:

$$P(x) = -x^3 + 115x^2 - 50x - 5500$$

- a) Interpret the value of
- $P(0)$
- in this context.

(1 mark)

- b) Use Calculus methods to determine the maximum profit.

(4 marks)

Additional working space

Question number: _____

(2 marks)

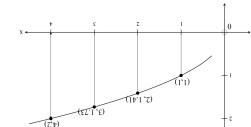
(6)

- c) Find the marginal profit when
- $x=50$
- and explain what this value predicts.

(3 marks)

(c) Show that the surface area of the shape, $A(x)$, is given by $A(x) = 2x^2 - \frac{12}{x} + \frac{12}{200}$ (3 marks)(b) Show that the value of y is given by $y = \frac{300}{x^2} - \frac{12}{x}$ (2 marks)(a) Determine V in terms of x and y . (1 mark)A square based prism is shown in the diagram has a hemisphere added to its top in such a way that the diameter of the hemisphere is the same as the width of the box. The volume (V) of the object is 600 cm³.

Question 22 (10 marks)



The function $f(x) = x^2$ is graphed below.
Question 23 (continued)

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