

Question	Mark	Max	Question	Mark	Max
4		8			
3		7			
2		6			
1		5			

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.

Important note to candidates

Special items: nil

To be provided by the candidate Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

To be provided by the supervisor Materials required/recommended for this section Formula sheet
This Question/Answer booklet

Time allowed for this section Working time: fifty minutes
Reading time before commencing work: five minutes

Your Teacher's Name _____

Your Name _____

UNITS 3 & 4
SPECIALIST MATHEMATICS
Section Done: Calculator-free
 Section Done: Calculator-free

Question/Answer booklet

Semester Two Examination, 2021



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	8	8	50	51	35
Section Two: Calculator-assumed	13	13	100	101	65
Total					100

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 2016*. 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 have been 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.

(4 marks)

Question 1

Evaluate $\int_{\frac{\pi}{2}}^{\pi} \cos 3x + \sin x \, dx$

Working time: 50 minutes.

- This section has **eight (8)** 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 if required to continue an answer.
 - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
 - Continuuing an answer: If you need to use the space to continue, i.e. give the page number of the original answer space where the answer is continued. Fill in the number of the question that you are continuing to answer at the top of the page.

(51 Marks)

MATHEMATICS SPECIALIST

Section One: Calculator-free

3

CALCULATOR-FREE

Acknowledgements

Question 2**(6 marks)**

Consider a plane that contains the following points $A(3, -2, 5), B(7, -1, -2) \text{ & } C(4, 4, -3)$.

- a) Determine a normal vector to the plane.

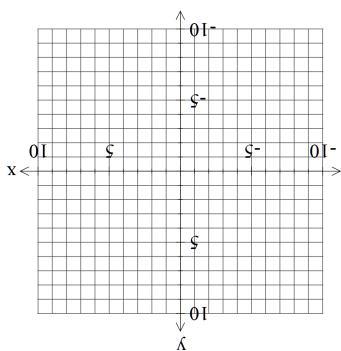
(4 marks)

- b) Determine a cartesian equation for the plane.

(2 marks)

Additional working space

Question number: _____



Sketch the function $f(x) = \frac{(x-5)(x+4)}{2x^2 + 8x - 42}$ on the axes below, labelling important features.

Question 4

(6 marks)

- a) Solve the following system of linear equations.

(3 marks)

$$\begin{aligned}-5x + y + 2z &= 12 \\ x + 2y + 3z &= -4 \\ 2x - y + z &= -18\end{aligned}$$

- b) Solve for all possible values of p & q for the system below for each of the following scenarios.

(3 marks)

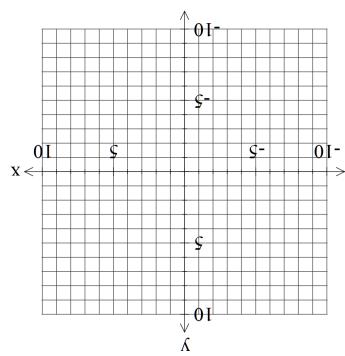
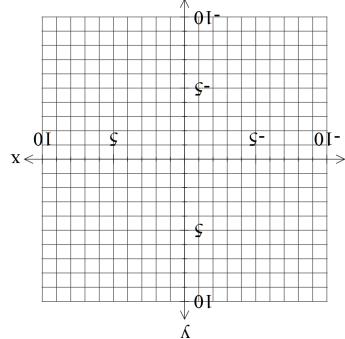
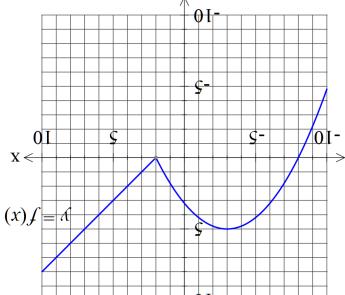
$$\begin{aligned}-5x + y + 2z &= 12 \\ x + 2y + pz &= -4 \\ 2x - y + z &= q\end{aligned}$$

- i) Unique solution.
- ii) Infinite solutions
- iii) No solutions.

Additional working space

Question number: _____

(4 marks)

b) Plot $y = \frac{f(x)}{|x|}$ on the axes below.a) Plot $y = f(|x|)$ on the axes below. (2 marks)

(6 marks)

Consider the function $f(x)$ drawn below.

(7 marks)

(3 marks)

a) Evaluate the following integrals.

$$\int_1^{\pi} (1 - 3x) \sqrt{5x + 2} dx$$

b) $\int_{\pi}^{\frac{\pi}{2}} \frac{x}{6\sec^2 x} dx$

Question 6

Consider the function $f(x) = \sin x$ with domain $0 \leq x \leq \frac{\pi}{2}$.
Let $g(x) = f^{-1}(x)$.

a) Determine the domain and range of $g(x)$.

(9 marks)

(2 marks)

b) By using implicit differentiation show that $g'(x)$ is of the form $\frac{1}{\sqrt{a^2 - x^2}}$ where a is a constant.

(4 marks)

c) Evaluate $\int \frac{1}{\sqrt{4-x^2}} dx$ with substitution $x = 2\sin u$.

(3 marks)

(7 marks)

Question 7

a) Given that $\frac{x^3 + 6x^2 - 3x + 8}{(x^2 + 2)(x^2 + 2x - 3)} = \frac{Ax + B}{x^2 + 2} + \frac{C}{x - 1} + \frac{D}{x + 3}$ with $A, B, C & D$ constants.
Solve for $A, B, C & D$.

(4 marks)

b) Hence determine an expression for $\int \frac{x^3 + 6x^2 - 3x + 8}{(x^2 + 2)(x^2 + 2x - 3)} dx$.

(3 marks)