

Question/Answer booklet

Semester One Examination, 2021

PERTH MODERN SCHOOL
INDEPENDENT PUBLIC SCHOOL



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

and it to those superintendents before reading any further.

Special items: nil

To be provided by the candidate

Formula sheet

Materials required/recommended for this section

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

Our Teacher's Name _____

Our Name

1

Calculator One:

UNIT 3

MATHEM

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	50	36
Section Two: Calculator-assumed	14	14	100	96	64
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.

Acknowledgements

Determine the coordinates of where the line above meets the plane.

$$r = \begin{pmatrix} 1 \\ -3 \\ 5 \\ 2 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 1 \\ -2 \\ 1 \end{pmatrix}$$

Question 1

Working time: 50 minutes.

- Placing a page number or date in the header or footer of a document can be done by inserting a page number or date field into the header or footer area. This is typically done by selecting the 'Page Number' or 'Page Date' option from the 'Header & Footer' tab in the ribbon, and then choosing where you want the information to appear.

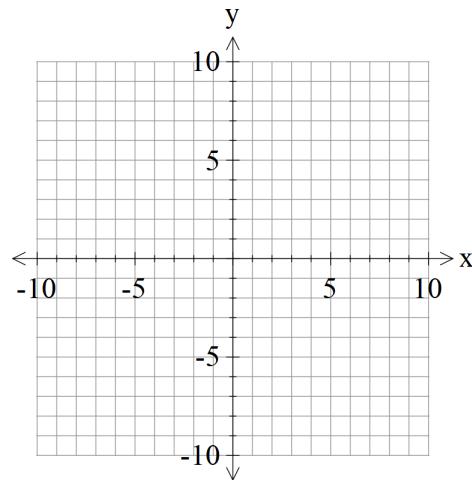
This section has eight (8) questions. Answer all questions. Write your answers in the spaces

Section One: Calculator-free (50 Marks)

Question 2

(6 marks)

Sketch the graph $y = f(x)$ where $f(x) = \frac{(x+2)(x-5)}{(x+1)(x-3)}$. Clearly show the major features of the graph.

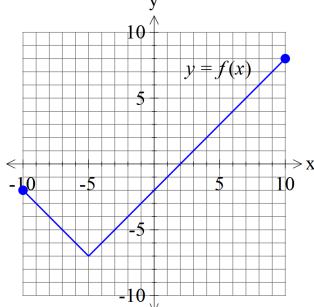


MATHEMATICS SPECIALIST	12	CALCULATOR-FREE	CALCULATOR-FREE	Additional working space (6 marks)
Question 3 MATHEMATICS SPECIALIST	5	Consider the plane π_1 that contains the following three points $A(1, -1), B(1, 2)$ & $C(3, -1, 2)$. Using vector methods, determine the distance of point $D(6, -7, 1)$ from the plane π_1 . Show all working and reasoning.	Question 3 CALCULATOR-FREE	Question 3 CALCULATOR-FREE

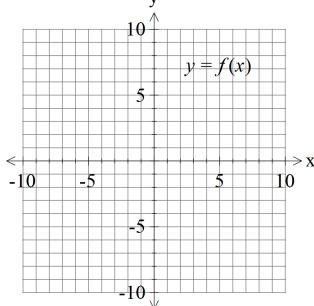
Question 4

(5 marks)

Consider the function $f(x)$ as graphed below.

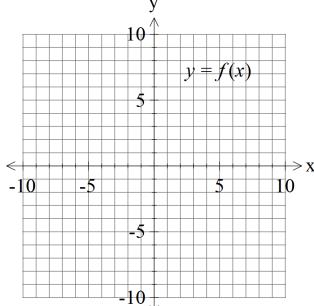


a) Graph $y = f(|x|)$ on the axes below.



(2 marks)

b) Graph $y = \frac{-1}{f(x)}$ on the axes below.

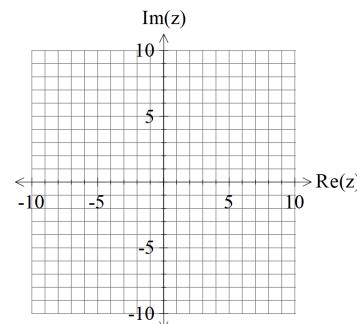


(3 marks)

Question 8

(3 marks)

Sketch the locus of points that satisfy $\text{Arg}(z - 5 - 7i) + \pi = \text{Arg}(z)$ on the complex plane below and explain your reasoning.



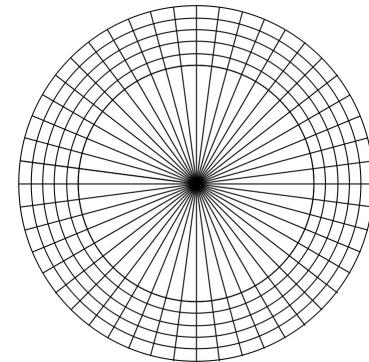
(3 marks)

a) Consider the function $f(x) = 4x^2 - 8x + 2$ with domain $x \leq 1$

(a) Determine $f^{-1}(x)$ and its domain.
 (4 marks)

(b) Consider $y(x) = x^2 + bx + c$ with $x \leq -\frac{b}{2}$ and $b < c$ real constants. Given that $y(x)$ has an inverse which intersects graphically with $y^{-1}(x)$ at one point only, determine a possible exact value for x in terms of $b & c$ and an equation that $b & c$ must satisfy.

- c) If these points are joined, forming a polygon, determine the exact area of this polygon. (3 marks)



- b) Plot the above roots on the diagram below, indicating scale. (3 marks)

(4 marks)

a) Solve for all solutions to the following $Z_\theta = -\sqrt{2} + 2i$ in the form $r cis \theta$ with $-\pi < \theta \leq \pi$.

- a) Solve for all solutions to the following $Z_\theta = -\sqrt{2} + 2i$ in the form $r cis \theta$ with $-\pi < \theta \leq \pi$. (4 marks)

(7 marks)

MATHEMATICS SPECIALIST

7

Question 5

CALCULATOR-FREE

CALCULATOR-FREE

(10 marks)

10

MATHEMATICS SPECIALIST

Question 6

Consider the following system of linear equations.

$$5x + y + 2z = 19$$

$$x - y + z = 8$$

$$2x - 3y + 4z = 27$$

a) Solve for $x, y \& z$.

(7 marks)

(3 marks)

Q6 cont-

b) If we modify the equations to the following with $p \& q$ being constants, solve for the following values of $p \& q$ such that there are:

- i) no solutions
- ii) infinite solutions (Give a geometrical interpretation of this situation) (4 marks)

$$5x + y + pz = 19$$

$$x - y + z = 8$$

$$2x - 3y + 4z = q$$