SCOTCH
COLLEGE

Scotch College
Semester One Examination, 2010

Question/Answer Booklet

MATHEMATICS
3C/3D Specialist

Section One:
Calculator free

Teacher: ____Mr Hill
____Mr Robb

Name:

Time allowed for this section
Reading time before commencing work: 5 minutes
Working time for this section: 50 minutes

Material 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, pencils, pencil sharpener, eraser, correction fluid, ruler, highlighters

Special items: nil

Important note to candidates

No other items may be used in this section of the examination. 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 any 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	50	40
Section Two Calculator-assumed	12	12	100	80
				120

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2010*. Sitting this examination implies that you agree to abide by these rules.

2. 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.

3. **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.

4. It is recommended that you **do not use pencil** except in diagrams.

Section One: Calculator-free **(40 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.

Suggested working time for this section is 50 minutes.

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1. [10 marks]

Given that $z_1 = 3 - 4i$ and $z_2 = -2 - 2i$, determine exactly:

(a) $\text{Im}(z_1 + z_2)$ **[1]**

(b) $\overline{z_1 z_2}$ **[2]**

(c) $\left|\frac{z_1}{z_2}\right|$ **[3]**

(d) the complex number k such that $\text{Im}(k) = 2\text{Re}(k) - 1$ and $k = \overline{k} + \text{Re}(k) \times i$. **[4]**

2. [8 marks]

Find $\frac{dy}{dx}$ for each of the following, simplifying answers wherever possible

(a) $y = \sqrt{\sin 2x}$ **[2]**

(b) $y = \tan^2(5 - \pi x)$ **[3]**

(c) $x \cos y + (y+1)^3 = \frac{\pi}{3}$ **[3]**

3. [5 marks]

Matrices **A , B** and **C** are all 2x2 matrices and $\mathbf{C} = \mathbf{A} - \mathbf{CB}$

Determine **C** given that $\mathbf{A} = \begin{bmatrix} -1 & 6 \\ 11 & 4 \end{bmatrix}$ *and* $\mathbf{B} = \begin{bmatrix} 1 & 2 \\ -5 & 1 \end{bmatrix}$

4. [4 marks]

Find the following indefinite integrals.

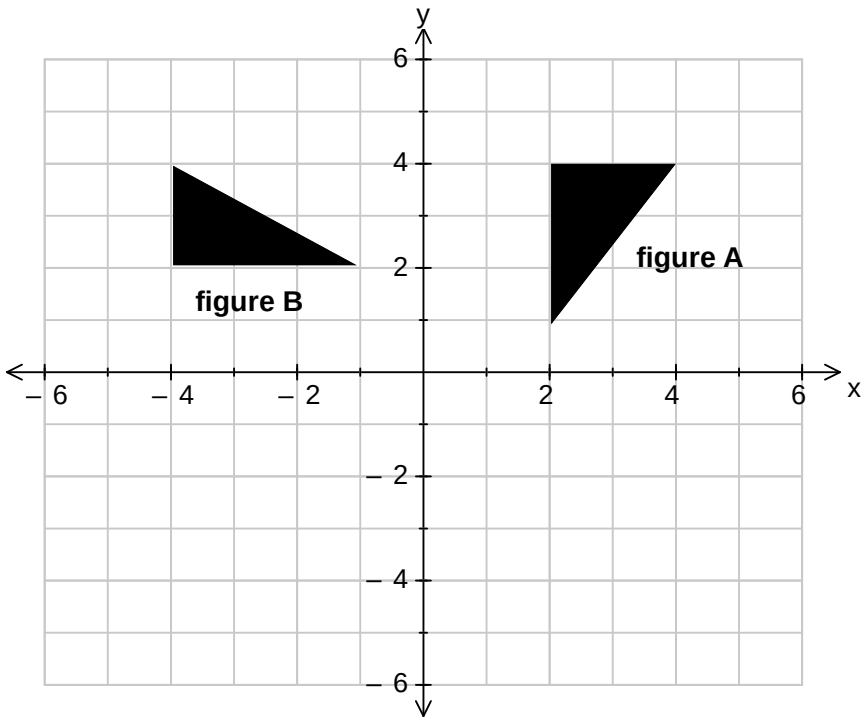
(a) $\int x^{\frac{1}{3}} - x^{-\frac{1}{3}} \, dx$ **[2]**

(b) $\int 4\sin(\cos x).\sin x \, dx$ **[2]**

5. [5 marks]

Use proof by induction to prove that $4^n + 2$ is divisible by 3 for $n \in \mathbb{Z}^+$.

6. [8 marks]



(a) Write down the 2x2 transformation that would map the points from figure A onto the points from figure B. **[1]**

(b) Find a 2x2 matrix, T , that would firstly *reflect* figure B about the X axis and then transform this image onto a triangle with half the area of figure B. Draw the image on the grid above and label it figure C. **[5]**

(c) Find a single transformation matrix that will map figure A onto figure C. **[2]**

Additional working space

Question number(s):_____

Additional working space

Question number(s):_____

Additional working space

Question number(s):_____

Section 1 Question	Marks Available	Marks Achieved	Teacher Comments
1	10		
2	8		
3	5		
4	4		
5	5		
6	8		
Total Marks Section 1	**40**		

Section 2 Question	Marks Available	Marks Achieved	Teacher Comments
1	5		
2	4		
3	5		
4	7		
5	6		
6	6		
7	6		
8	10		
9	8		
10	7		
11	6		
12	10		
Total Marks Section 2	**80**		

Exam Total	**120**	