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WESLEY COLLEGE
SOUTH PERTH

Semester One Examination 2011

Question/Answer Booklet

MATHEMATICS 3C/3D

Section One: Calculator-free

Student Name: _____

Time allowed for this section

Reading time before commencing work: Five (5) minutes
Working time for this section: Fifty (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	Percentage of exam
Section One: Calculator-free	8	8	50	40	33 1/3
Section Two: Calculator-assumed	11	11	100	80	66 2/3
				120	100

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.

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Additional working space

Question number(s):_____

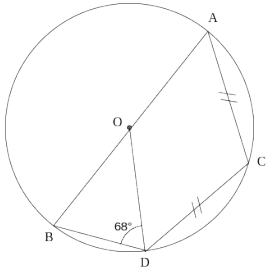
Question 8 **(4 marks)**

AB is the diameter of a circle with centre *O*, as shown.

C and *D* are located on the circumference such that $AC = CD$

If $\angle ODB = 68^\circ$, determine $\angle BAC$.

Give reasons for all statements made.



Section One: Calculator-free **(40 Marks)**

This section has **eight (8)** 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.

The working time for this section is 50 minutes.

Question 1 **(4 marks)**

Solve the system of equations $\begin{cases} 2x + 3y - z = 10 \\ x - 2y + 2z = 0 \\ 3x - y + 3z = 6 \end{cases}$

Question 2 **(7 marks)**

Differentiate each of the following:

(You do not need to perform more than the most obvious algebraic simplifications)

(a) $y = \left(\sqrt{x} + 2x\right)^3$ (2 marks)

(b) $f(x) = \dfrac{e^x}{1 - e^x}$ (2 marks)

(c) $g(x) = e^{\frac{1}{x^2}}\left(1 + \dfrac{1}{x^2}\right)$ (3 marks)

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Question 7 **(5 marks)**

Describe, or illustrate with a sketch, how a polynomial curve $y = f(x)$ behaves under each of these separate conditions:

(a) $f(x) = 0$

(b) the gradient is increasing

(c) $f''(x)$ changes sign

(d) $f'(x) = 0$ but $f'(x) > 0$ nearby

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Question 6 **(6 marks)**

For $f(x) = \sqrt{2 - x}$ and $g(x) = x^2 + 1$, determine:

(a) the domain of $y = f(x)$ (1 mark)

(b) the range of $y = g(x)$ (1 mark)

(c) $f(g(x))$ (1 mark)

(d) the domain and the range of $g \circ f(x)$ (3 marks)

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Question 3 **(6 marks)**

For which value(s) of x is:

(a) $5x < x^2$ (2 marks)

(b) $\frac{1}{x+1} \geq \frac{x}{3-x}$ (4 marks)

Question 4 **(5 marks)**

Fred is selling raffle tickets and will sell x of them at $\$\left(\frac{10}{\sqrt{x}} - 1\right)$ each.
How many need he sell to maximise his total sales?

Clearly demonstrate that your solution is a relative maximum.

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Question 5 **(3 marks)**

Take a sequence of 5 consecutive positive integers, such as 7, 8, 9, 10 and 11.

If you subtract the product of the first and last integer from the product of the second and second last you will get, in this case, $8 \times 10 - 7 \times 11 = 3$

Prove that, for any sequence of 5 consecutive positive integers, the difference between the product of the first and last and the product of the second and second last is always 3.

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