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Government of Western Australia
Curriculum Council

WACE
Western Australian Certificate of Education

**Western Australian Certificate of Education Examination, 2010**

**Question/Answer Booklet**

# MATHEMATICS 3C/3D

Please place your student identification label in this box

## Section One: Calculator-free

Student Number: In figures | | | | | | | | |

In words _____

_____

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

### Materials required/recommended for this paper
***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/tape, ruler, highlighters

Special items: nil

### 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 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.

 Ref: 10-136

## 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 | |
| Section Two: Calculator-assumed | 12 | 12 | 100 | 80 | |
| | | | **Total** | 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.

**See next page**







**Additional working space**

Question number: _____

**Additional working space**

Question number: _____







**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.

Working time: 50 minutes.

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**Question 1** **(4 marks)**

Differentiate the following, without simplifying:

(a) $y = \dfrac{x-1}{x^2+4}$ (2 marks)

(b) $y = x^5 e^{-3x}$ (2 marks)

**Question 2** **(4 marks)**

Determine the domain and range of $f(g(x))$, given that $f(x) = \sqrt{1-x}$ and $g(x) = 3^x - 8$

**See next page**

**Question 3** **(5 marks)**

Find the maximum and minimum values over the interval $1 \leq x \leq 5$ of the function

$$f(x) = 3x + \frac{16}{x^3}$$

**Question 4** **(3 marks)**

Solve for $x$ the inequality

$$\frac{1}{x-1} < \frac{1}{x+1}$$

**See next page**







**Additional working space**

Question number: _____

**Question 8** **(5 marks)**

Solve the system of equations

$$\begin{aligned} x - 4y - 3z &= 1 \\ x + 2y + 3z &= 4 \\ 3x - 8y - z &= 1 \end{aligned}$$

**End of questions**



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**Question 5** **(6 marks)**

(a) Evaluate $\int_1^3 (x^3 - 1)dx$ (3 marks)

(b) Determine $\int x(1 - x^2)^{10}dx$ (3 marks)

**Question 6** **(3 marks)**

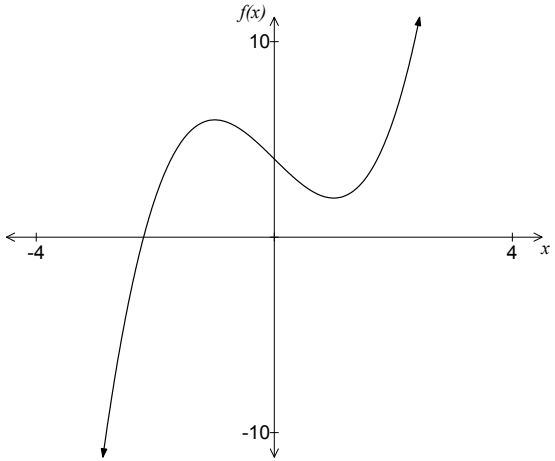
A certain type of computer password is 8 characters long. Six of the characters are lower-case letters from the English alphabet, i.e. members of the 26-element set $\{a, b, c, \ldots, x, y, z\}$. The other 2 characters are decimal digits. However, the decimal digits must occur consecutively. So $gyjp53iw$ is a possible password, but $af4tfz0y$ is not.

How many possible passwords are there? Give your answer as an arithmetical expression, without evaluating.

**See next page**

**Question 7** **(10 marks)**

The graph of $y = f(x) = x^3 - 3x + 4$ is shown below.




(a) Determine the coordinates of the turning points of the function $f$ (3 marks)







(b) For what values of $x$ is it true that $f'(x) < 0$ and $f''(x) > 0$? (2 marks)

(c) Without integrating, use the graph of $y = f(x)$ to explain why $\int_{-1}^{1} f(x)dx = 8$ (2 marks)

The function $g(x)$ is defined by $g(x) = f(2x)$

(d) Show that $g(x) = 8x^3 - 6x + 4$ (1 mark)

(e) Sketch on the axes on page 6 the graph of $y = 8x^3 - 6x + 4$ (2 marks)