

**Question/Answer Booklet****Semester One Examination, 2013****SCHOOL**place your student identification label in this box  
If required by your examination administrator, please**MATHEMATICS 3C****Calculator-free****Section One:**

Student Number:      In figures

Your name  
\_\_\_\_\_  
In words

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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

**Time allowed for this section****Materials required/recommended for this section****To be provided by the supervisor****Standard items: pens, pencils, pencil sharpener, eraser, correction fluid/tape, ruler, highlighters****To be provided by the candidate**

Special items:      nil

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.

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**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	7	7	50	49	33
Section Two: Calculator-assumed	13	13	100	100	67
<b>Total</b>				149	100

**Additional working space**

Question number: \_\_\_\_\_

**Instructions to candidates**

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2013*. 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.

(5 marks)

Question 1

Find the area of the region trapped between the line  $y = 2$  and the curve  $y = x^2 - 4x + 5$ .

(49 Marks)

Working time for this section is 50 minutes.

provided.

This section has **seven (7)** questions. Answer all questions. Write your answers in the spaces

Section One: Calculator-free

Question number: \_\_\_\_\_

Additional working space

**Question 2**

(7 marks)

- (a) Determine  $\frac{dy}{dx}$  for each of the following. Do not simplify your answers.

(i)  $y = \frac{5x^2}{3x + 2}$

(2 marks)

(ii)  $y = (x^2 - 4)^3$

(2 marks)

- (b) Find the coordinates of the point on the curve  $y = x^3 - 2x^2 - 5x + 1$  where  $\frac{d^2y}{dx^2} = 2$ .  
(3 marks)

Question number: \_\_\_\_\_

Question 7

Question 3

(7 marks)

- (a) Write as a single fraction  $1 + \frac{3x}{2} + \frac{4}{x^2}$ . Find the global minimum and maximum values of the function  $f(x) = \frac{x^2}{8} + 2x$  over the interval  $1 \leq x \leq 4$ .

(2 marks)

- (b) Show that  $\frac{4x^2 - 4x + 1}{3 - 2x} + \frac{1}{2x - 1}$  can be written as  $\frac{(1 - 2x)^2}{2}$ . Given that  $\int \frac{4x^2 - 4x + 1}{3 - 2x} dx = \frac{a}{b - cx} + k$ , find the values of the positive constants  $a$ ,  $b$  and  $c$ .

(3 marks)

- (ii) Given that  $\int \frac{4x^2 - 4x + 1}{3 - 2x} dx = \frac{a}{b - cx} + k$ , find the values of the positive constants  $a$ ,  $b$  and  $c$ .

(7 marks)

**Question 4**

Let  $f(x) = x(x+1)$  and  $g(x) = 5x - 1$ .

(a) State the domain of  $f(x)$ .

(1 mark)

(b) For what value(s) of  $x$  does  $f \circ f(x) = f(x)$ ?

(3 marks)

(c) Consider two polynomial functions  $g(x)$  and  $h(x)$  for which the following is known:

$$\int_{-1}^1 g(x) dx = 15$$

$$\int_{-1}^1 (g(x) + h(x)) dx = 12$$

$$\int_{-1}^2 h(x) dx = 2$$

$$\int_{-1}^2 (g(x) + h(x)) dx = -7$$

Determine:

(i)  $\int_{-1}^1 h(x) dx$

(1 mark)

(ii)  $\int_{-1}^2 g(x) dx$

(3 marks)

(c) Determine the range of  $f \circ g(x)$ . (4 marks)

- (a) If  $f(x) = 20(1-x)^3$ , and  $f(2) = 5$ , determine  $f(3)$ . (3 marks)
- (b) Evaluate  $\int_2^x \frac{3}{x^2} dx$ . (3 marks)

**Question 5****(9 marks)**

- (a) Differentiate  $y = (x - 1)(x^2 + 1)^3$  with respect to  $x$ , expressing your answer as a product of quadratic factors.

(4 marks)

- (b) Find the equation of the tangent to the graph of  $y = \frac{e^{x^2-1}}{x^3+2}$  at the point where  $x = -1$ .

(5 marks)