

# ROSSMOYNE SENIOR HIGH SCHOOL



Yr11

Semester Two Examination, 2012

Question/Answer Booklet

## MATHEMATICS SPECIALIST 3A/3B MAS

Section One:

Calculator-free

Your name \_\_\_\_\_

Teacher's name \_\_\_\_\_

### Time allowed for this section

Reading time before commencing work: five minutes

Working time for this section: fifty minutes

### Materials 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/tape, 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	7	7	50	50	33
Section Two: Calculator-assumed	13	13	100	100	67
Total				150	100

## Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2012*. 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****(50 Marks)**

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

Working time for this section is 50 minutes.

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**Question 1****(6 marks)**

The complex numbers  $z$  and  $w$  are given by  $z = 8 - 6i$  and  $w = 3 + ai$ .

(a) Determine  $z \times \bar{z}$ . (2 marks)

(b) Find  $\text{Im}(w^2)$  if  $a = 5$ . (2 marks)

(c) The value of  $a$  if  $w^2 = z$ . (2 marks)

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

Determine the values of  $a$  and  $b$  if the function

$$f(x) = \begin{cases} a + \frac{4}{x} & 0 < x < 2 \\ bx^2 - 2 & x \geq 2 \end{cases}$$

is both continuous and differentiable at  $x = 2$ .

**Question 3****(9 marks)**

(a) Solve  $\log_x 64 = 3$ .

(1 mark)

(b) Rearrange the equation  $11^{2x+3} = 33$  for  $x$ .

(2 marks)

(c) Solve  $2(\log_3 x + 1) = \log_3 25$ .

(3 marks)

(d) If  $a = \log_5 4$  and  $b = \log_5 8$ , express the following in terms of  $a$  and  $b$ :

(i)  $\log_5 32$

(1 mark)

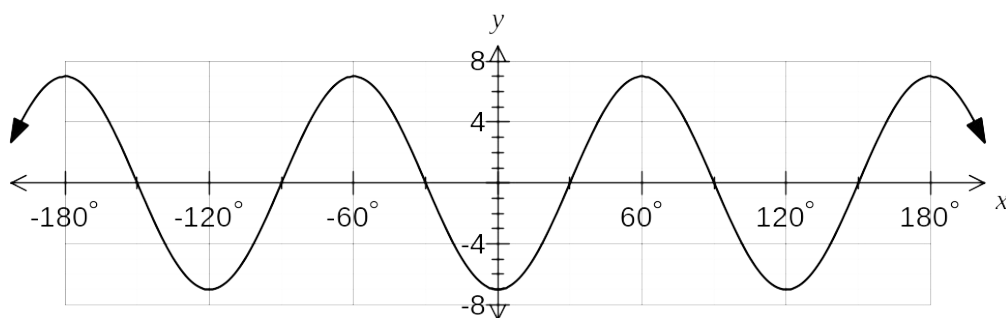
(ii)  $\log_5 400$

(2 marks)

**Question 4**

**(11 marks)**

(a) The graph of the trigonometric function  $y = f(x)$  is shown.

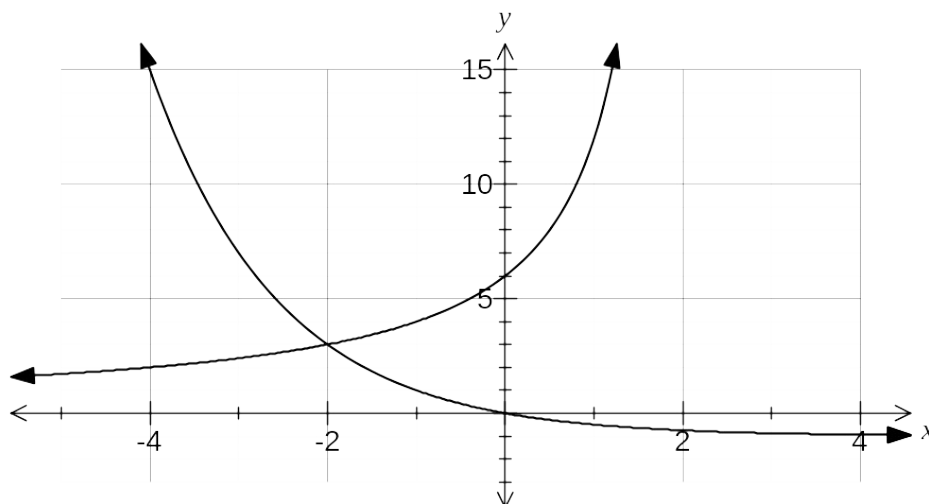


(i) State the amplitude of  $f(x)$ . (1 mark)

(ii) State the period of  $f(x)$ . (1 mark)

(iii) State the equation of the trigonometric function  $f(x)$ . (2 marks)

- (b) The graphs of  $g(x) = \frac{a}{b-x}$  and  $h(x) = 4^{cx} + d$ , where  $a$ ,  $b$ ,  $c$  and  $d$  are all non-zero constants are shown below, intersecting at  $(-2, 3)$ .



- (i) Explain why  $g(x)$  cannot pass through the origin. (2 marks)
- (ii) Find the values of  $a$ ,  $b$ ,  $c$  and  $d$ . (5 marks)

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

Differentiate the following, simplifying where possible.

(a)  $y = \frac{\log_e(4 - x^3)}{12}$

**(2 marks)**

(b)  $y = \frac{3x}{2x+1} - \frac{1}{2x+1}$

**(3 marks)**

(c)  $y = (e^{\sqrt{x}} + 5)^4$

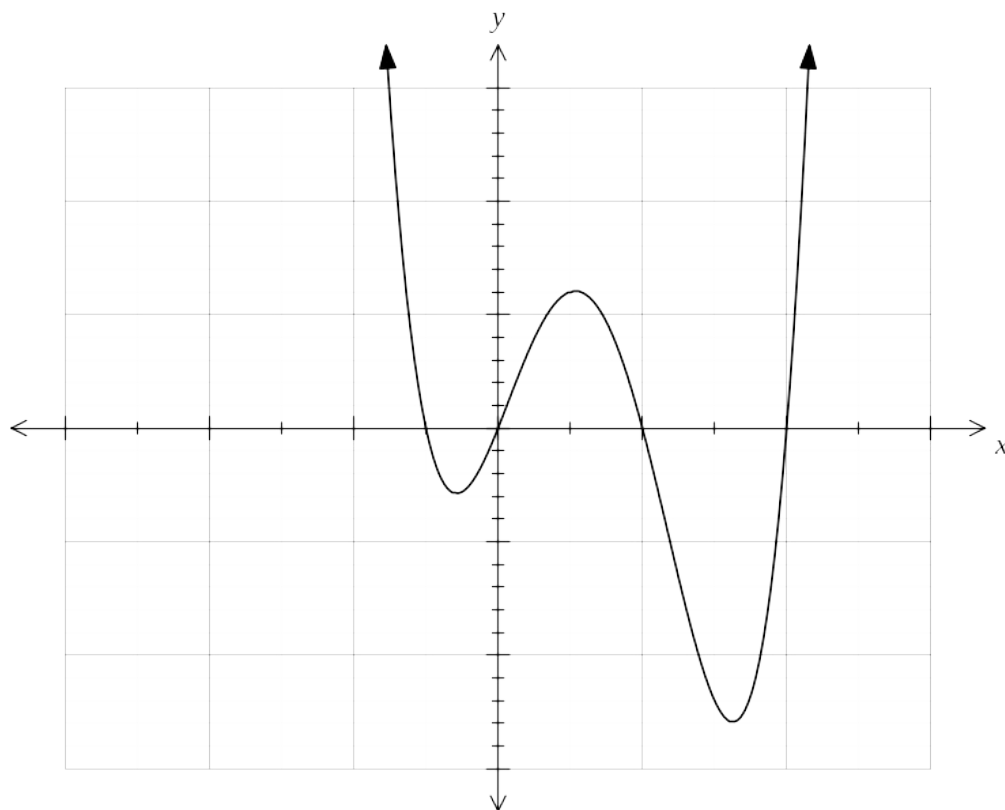
**(3 marks)**



**Question 6**

**(4 marks)**

The graph of  $y = f(x)$  is shown.



(a) Draw the graph of  $y = f(|x|)$  on the same axes. (2 marks)

(b) Briefly explain how to obtain the graph of  $y = f(|x|)$  from  $y = f(x)$ . (2 marks)

## Question 7

(8 marks)

(a) Show that  $\tan(\theta) + \tan(2\theta) = \frac{\tan^3(\theta) - 3\tan(\theta)}{\tan^2(\theta) - 1}$ .

(3 marks)

(b) Solve the equation  $\tan(\theta) + \tan(2\theta) = 0$  for  $0 \leq \theta \leq \pi$ .

(5 marks)

**Additional working space**

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

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