

Question	Marks Available	Marks Obtained
1	4	
2	8	
3	4	
4	4	
5	13	
6	5	
7	7	
8	7	
TOTAL	52	
Weighted Score	35	



Perth College

Semester Two Examination, 2016  
Question/Answer Booklet

**MATHEMATICS  
METHODS  
UNITS 1 AND 2  
Section One:  
Calculator-free**

If required by your examination administrator, please place your student identification label in this box

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Student Number: In figures

In words

Your name

**Time allowed for this section**

Reading time before commencing work: five minutes  
Working time for 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 (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, 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.

### 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	52	35
Section Two: Calculator-assumed	12	12	100	98	65
<b>Total</b>				150	100

### Instructions to candidates

1. The rules for the conduct of examinations are detailed in the school handbook. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer Booklet.
3. You must be careful to confine your response to the specific question asked and to follow any instructions that are specified to a particular question.
4. 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 that you are continuing to answer at the top of the page.
5. **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 any question, ensure that you cancel the answer you do not wish to have marked.
6. It is recommended that you **do not use pencil**, except in diagrams.
7. The Formula Sheet is **not** to be handed in with your Question/Booklet.

### Additional working space

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

Question 8

Let  $f(x) = \frac{1}{x+1}$ ,  $x \neq -1$ .

(a) Sketch the graph of  $y = f(x)$  on the axes below.

(3 marks)

Section One: Calculator-free

35% (52 Marks)

This section has eight (8) questions. Answer all questions. Write your answers in the spaces provided.

Working time for this section is 50 minutes.

Question 1

(4 marks)

A box contains a total of 500 marker and highlighter pens of various colours, as shown in the table. Some of the marker pens are permanent and the rest are non-permanent.

Colour				Type of pen				
	Black	Yellow	Pink	Green	Permanent marker	55	83	40
					Non-permanent marker	45	67	24
					Highlighter	0	50	46
								54

A pen is selected at random from the box. Determine the probability that it is

- (a) a yellow pen.
- (1 mark)

- (b) a marker pen.
- (1 mark)

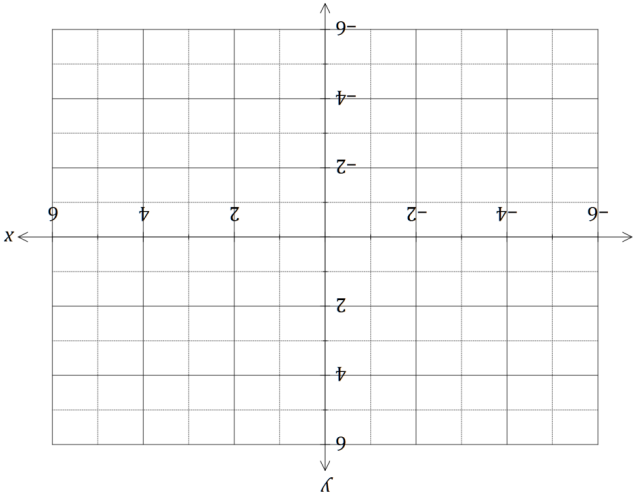
- (c) a yellow pen or a marker pen.
- (1 mark)

- (d) a green pen, given that it is a highlighter.
- (1 mark)

See next page

(7 marks)

(3 marks)



- (b) Evaluate  $\frac{f(x+h)-f(x)}{h}$  as  $h \rightarrow 0$  to determine the slope of  $f(x)$  when  $x = 2$ .
- (4 marks)

End of questions

Question 2

(8 marks)

(a) Determine  $f'(x)$  when

(i)  $f(x) = 3.$

(1 mark)

(ii)  $f(x) = 5x^2 - 4x.$

(1 mark)

(iii)  $f(x) = \frac{x^3 - 5x}{x}.$

(2 marks)

(b) Simplify  $\lim_{h \rightarrow 0} \frac{(x+h)^4 - x^4}{h}$

(1 mark)

(c) Calculate the gradient of the curve  $y = 2x^5 - 3x^4$  where  $x = -1.$

(3 marks)

Question 7

(7 marks)

The first three terms, in order, of a geometric sequence are  $x - 5$ ,  $x - 1$  and  $2x + 4.$

(a) Explain why  $(x - 1)(x - 1) = (x - 5)(2x + 4).$

(2 marks)

(b) Determine the value(s) of  $x.$

(3 marks)

(c) Determine all possible values for the fourth term of the sequence.

(2 marks)

Question 6

(5 marks)

The expression  $(2x - 1)^3$  can be expanded to give  $8x^3 + ax^2 + 6x - 1$ . Show that the value of  $a$  is  $-12$ .

(2 marks)

Question 3

(4 marks)

$A$  and  $B$  are independent events such that  $P(A) = \frac{3}{2}$  and  $P(B) = \frac{1}{4}$ . Determine

(1 mark)

(a)

$P(A \cap B)$ .

(1 mark)

(b)

$P(B|A)$ .

(1 mark)

(b)

Using the result from (a), or otherwise, determine  $f(x)$  if  $f'(x) = (2x - 1)^3$  and  $f(1) = 5$ .

(3 marks)

(c)

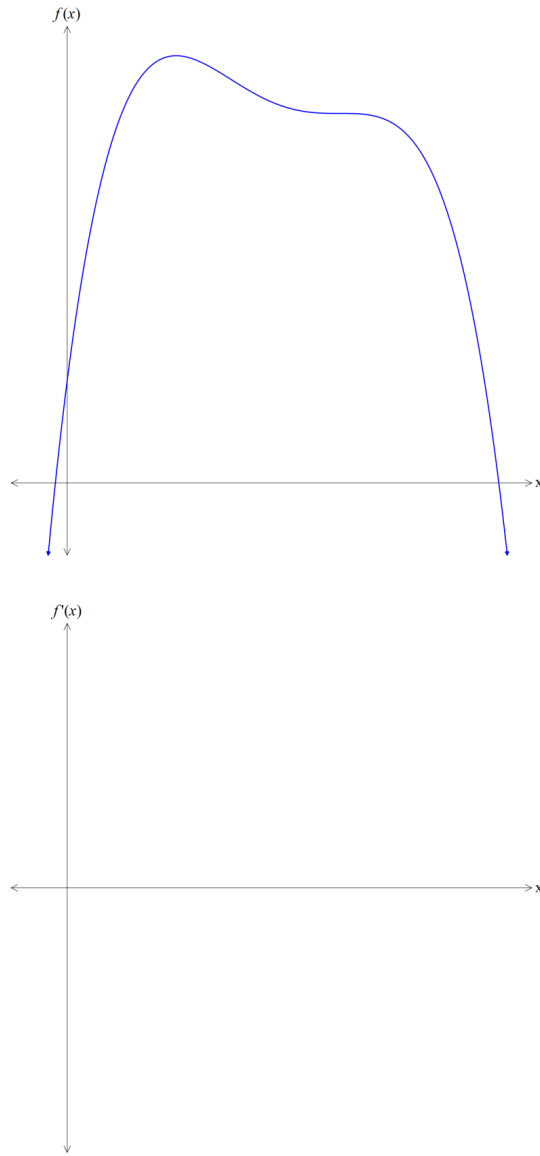
$P(A \cup B)$ .

(2 marks)

## Question 4

(4 marks)

The graph of  $y = f(x)$  is drawn below. Use this to draw a possible graph of  $y = f'(x)$  on the axes provided.



See next page

## Question 5

(13 marks)

(a) Solve the following equations for  $x$ :

(i)  $3^{x+1} = 9^{1-x}$ . (3 marks)

(ii)  $2 \cos x = \sqrt{3}$ ,  $0 \leq x \leq 720^\circ$ . (3 marks)

(iii)  $\sin 2x \cos x + \cos 2x \sin x = 1$ ,  $0 \leq x \leq \pi$ . (3 marks)

(b) The equation  $x^3 - x^2 - 14x + 24 = 0$  has  $x = 2$  as a solution. Determine all other solutions to the equation. (4 marks)

See next page