

Baldivis Secondary College

WAEP Semester One Examination, 2016

Question/Answer booklet

MATHEMATICS METHODS UNIT 3

Section One: Calculator-free

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

Student number: In figures

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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 material. 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	48	35
Section Two: Calculator-assumed	13	13	100	101	65
Total					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. Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space 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/Answer booklet.

Section One: Calculator-free

35% (48 Marks)

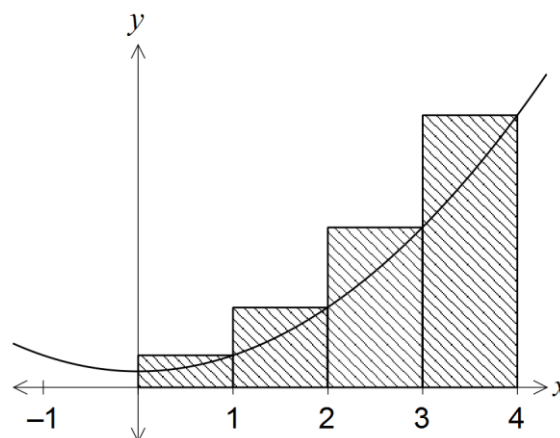
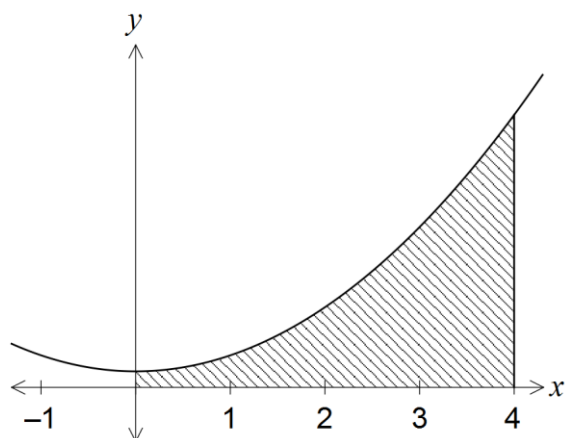
This section has **eight (8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time for this section is 50 minutes.

Question 1

(5 marks)

Part of the graph of $y = x^2 + 1$ is shown in the diagrams below.



An approximation for the area beneath the curve between $x = 0$ and $x = 4$ is made using rectangles as shown in the right-hand diagram. Determine the exact amount by which the approximate area exceeds the exact area.

Question 2

(9 marks)

(a) Differentiate the following with respect to x , simplifying your answers.

(i) $y = \int_x^1 (t - t^3) dt.$ (2 marks)

(ii) $y = \sin^3(2x + 1).$ (3 marks)

(b) Determine the values of the constants a , b and c , given that $f''(x) = e^{3x}(ax^2 + bx + c)$ when $f(x) = x^2 e^{3x}.$ (4 marks)

Question 3**(6 marks)**

A function $P(x)$ is such that $\frac{dP}{dx} = ax^2 - 12x$, where a is a constant and the graph of $y = P(x)$ has a stationary point at $(4, 8)$. Determine $P(10)$.

Question 4**(7 marks)**

Consider the function defined by $f(x) = \frac{x}{2} - \sqrt{x}$, $x \geq 0$.

(a) Determine the coordinates of the stationary point of $f(x)$. (3 marks)

(b) Use the second derivative test to determine the nature of the stationary point found in (a). (3 marks)

(c) State the global minimum of $f(x)$. (1 mark)

Question 5**(5 marks)**

The area of a segment with central angle θ in a circle of radius r is given by $A = \frac{r^2}{2}(\theta - \sin \theta)$.

Use the increments formula to approximate the increase in area of a segment in a circle of radius 10 cm as the central angle increases from $\frac{\pi}{3}$ to $\frac{11\pi}{30}$.

Question 6

(5 marks)

(a) Differentiate $y = \frac{2x+1}{e^x}$, simplifying your answer.

(3 marks)

(b) Evaluate $\int_1^2 \left(\frac{1-2x}{e^x} \right) dx$.

(2 marks)

Question 7

(6 marks)

The discrete random variable X has the probability distribution shown in the table below.

x	0	1	2	3
$P(X = x)$	$\frac{2a^2}{3}$	$\frac{1-3a}{3}$	$\frac{1+2a}{3}$	$\frac{4a^2}{3}$

Determine the value of the constant a .

Question 8**(5 marks)**

The area bounded by the curve $y = e^{2-x}$ and the lines $y = 0$, $x = 1$ and $x = k$ is exactly $e - 1$ square units. Determine the value of the constant k , given that $k > 1$.

Additional working space

Question number: _____

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