

before reading any further.

If you have any unauthorised material with you, hand it to the supervisor
you do not have any unauthorised notes or other items of a non-personal nature in the
examination room.

No other items may be taken into the examination room. It is **your** responsibility to ensure that

Important note to candidates

Special items: nil

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction

fluid/tape, eraser, ruler, highlighters

Formula Sheet

This Question/Answer Booklet

To be provided by the supervisor

Materials required/recommended for this section

Working time for section: fifty minutes

Reading time before commencing work: five minutes

Time allowed for this section

Your Teacher _____

Your Name _____

Calculator-free

Section One:

UNIT 3

METHODS

MATHEMATICS

Question/Answer Booklet

Semester One Examination, 2016

Rossmyne Senior High School



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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	8	8	50	48	35
Section Two: Calculator-assumed	13	13	100	101	65
Total			149	100	

Additional working space

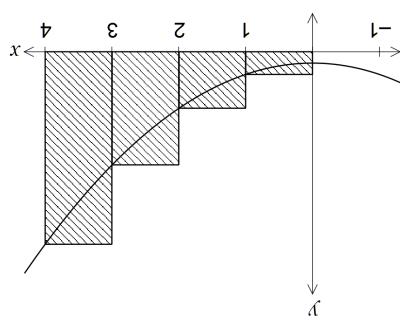
Question number: _____

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/Answer Booklet.

(5 marks)

Question 1



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

Working time for this section is 50 minutes.

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

Section One: Calculator-free

35% (48 Marks)

METHODS UNIT 3

3

CALCULATOR-FREE

Question 8

(5 marks)

CALCULATOR-FREE

10

The area bounded by the curve $y = e^{-x}$ 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 $k > 1$.

Section One: Calculator-free

35% (48 Marks)

METHODS UNIT 3

3

CALCULATOR-FREE

35% (48 Marks)

METHODS UNIT 3

Section One: Calculator-free

35% (48 Marks)

METHODS UNIT 3

3

CALCULATOR-FREE

35% (48 Marks)

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(9 marks)

Question 2

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

(i) $y = \int_1^x (t - t^3) dt$.

(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 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 .

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

(3 marks)

Question 3

(6 marks)

A function $P(x)$ is such that $\frac{dp}{dx} = ax^2 - 12x$ has a stationary point at $(4, 8)$. Determine $P(10)$.

(2 marks)

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

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 $\frac{11\pi}{30}$.