

Question	Marks	Max	Question	Marks	Max
4		5	7	7	7
3		7	6		12
2		5	8		
1	4	8			

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.

Important note to candidates

Special items: nil

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters
To be provided by the candidate

Formula sheet
 This Question/Answer booklet

Materials required/recommended for this section

Working time: fifty minutes
 Reading time before commencing work: five minutes
To be provided by the supervisor

Your Teacher's Name:

Your Name:

Calculator-free
 Section One:
UNIT 3 & 4
MATHEMATICS METHODS

Question/Answer booklet

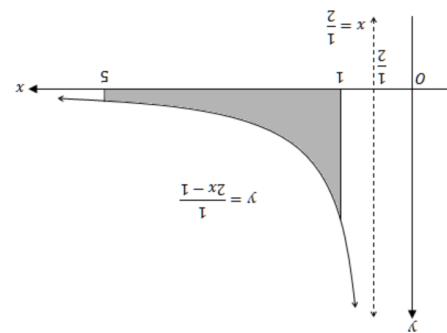
Semester Two Examination, 2020

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of examination
Section One: Calculator-free	7	7	50	50	35
Section Two: Calculator-assumed	10	10	100	94	65
Total					100

Instructions to candidates

1. The rules for the conduct of the Western Australian Certificate of Education ATAR course examinations are detailed in the *Year 12 Information Handbook 2019*. 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 answers to the specific questions asked and to follow any instructions that are specific to a particular question.
4. Additional pages for the use of planning your answer to a question or continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number.
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.



Leave your answer in the exact simplified form.

Determine the area bounded by the curve $y = \frac{2x-1}{1}$, the x -axis and the lines $x=1$ and $x=5$.

**Question 1
(4 marks)**

Question 1

Working time: 50 minutes.

- Countinuing an answer: if you need to use the space to continue an answer, indicate this clearly at the top of the page.
 - Planning: if you use the spare pages for planning, indicate this clearly at the top of the page.
 - Responses and/or as additional space if required to continue an answer.
- 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.

(50 Marks)

Question 2
(7 marks)Suppose that $f(x)$ and $g(x)$ are differentiable functions that satisfy the following properties.

$f(3)$	-2
$g(3)$	3
$f'(3)$	-1
$g'(3)$	0

Additional working space

Question number: _____

(a) Given $h(x)=\frac{f(x)}{g(x)}$ determine the value for $h'(3)$.
(2 marks)(b) Given $T(x)=f(g(x))$, determine the value for $T'(3)$.
(2 marks)(c) Given $S(x)=\ln(-f(x))$, determine the value for $S'(3)$.
(3 marks)

(4 marks)

(b) Hence determine $\int_{e^{-2}}^e \ln(x) dx$

(3 marks)

(a) Determine $\frac{d}{dx} x \ln(x)$ and simplify your answer

(7 marks)

MATHEMATICS METHODS

12

CALCULATOR-FREE

CALCULATOR-FREE

Question 3

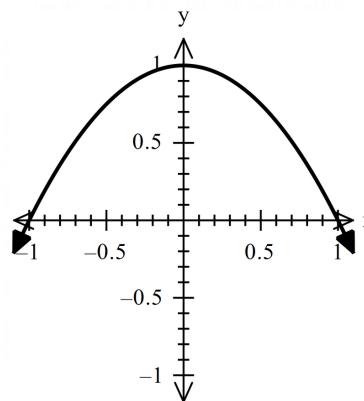
5

Additional working space _____

Question number: _____

Question 4
(5 marks)

A rectangle is inscribed with its base on the x -axis and its upper corners on the parabola $y=1-x^2$. Determine the dimensions of such a rectangle with the greatest possible area.



(b) Determine a formula for a linear function $g(t)=at+b$, $5 \leq t \leq 7$, given that the object returns to the origin at the end of 7 minutes, that is, $\int_0^7 v(t) dt = 0$. (4 marks)

(8 marks)

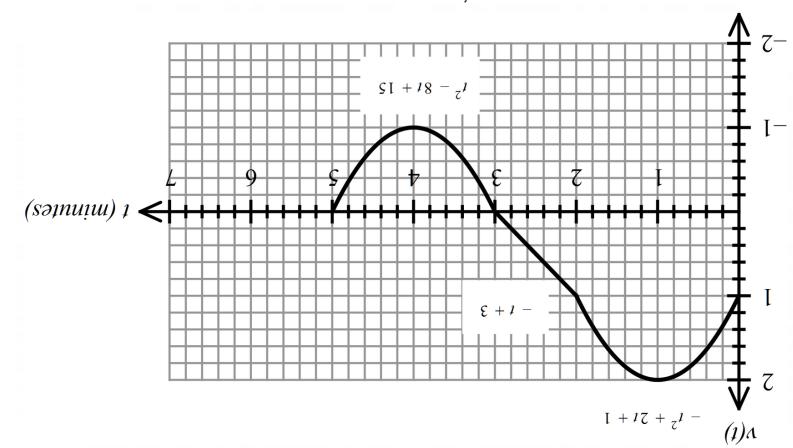
- (a) Determine an equation of the line perpendicular to the graph of $y = \ln(x - 1)$ at $x = 2$.
 (4 marks)

- (b) Determine an equation of the line tangent to the graph of $y = x^2 + \sin\left(\frac{\pi}{L}x\right)$ at $x = -1$.
 (4 marks)

(3 marks)

(a) Determine $\int_5^0 v(t) dt$.

$$v(t) = \begin{cases} -t^2 + 2t + 1, & 0 \leq t < 2 \\ -t + 3, & 2 \leq t < 3 \\ t^2 - 8t + 15, & 3 \leq t < 5 \\ g(t), & 5 \leq t \leq 7 \end{cases}$$



The following diagram shows the instantaneous velocity $v(t)$ m/min of a moving object during the first 5 minutes, where t is in minutes.

(7 marks)

The following diagram shows the instantaneous velocity $v(t)$ m/min of a moving object during

Question 7

- (a) Determine an equation of the line perpendicular to the graph of $y = \ln(x - 1)$ at $x = 2$.
 (4 marks)

Question 5

Question 6
(12 marks)

The discrete random variable X has probability distribution given by

x	-1	0	1	2	3
$P(X=x)$	$\frac{1}{5}$	a	$\frac{1}{10}$	a	$\frac{1}{5}$

where a is a constant.

(a) Determine the value of a .
(2 marks)

(2

(b) Determine $E(X)$.
(2 marks)

(c) Determine $Var(X)$.
(3 marks)

Another random variable is given as $Y=6-2X$

(d) Determine $Var(Y)$.

(2 marks)

(e) Calculate $P(X \geq Y)$.

(3 marks)