

Name: \_\_\_\_\_

Teacher: \_\_\_\_\_

TIME ALLOWED FOR THIS SECTION

Reading time before commencing work:  
Working time for section:  
50 minutes  
50 minutes

MATERIAL REQUIRED / RECOMMENDED FOR THIS SECTION

To be provided by the candidate  
Standard items: pens, pencils, pencil sharpener, highlighter, eraser, ruler.

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.

To be provided by the supervisor

Question/answer booklet for Section One.  
A formula sheet which may also be used for Section Two.

**Structure of this examination**

	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of exam
<b>Section One Calculator—free</b>	<b>7</b>	<b>7</b>	<b>50</b>	<b>50</b>	<b>35</b>
Section Two Calculator—assumed	13	13	100	100	65
Total marks				150	100

**Instructions to candidates**

1. The rules for the conduct of this examination are detailed in the Information Handbook. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in the Question/Answer booklet.
3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.
4. Spare pages are provided at the end of this booklet. If you need to use them, 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 an answer to 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.

1. (5 marks)

Given  $f(1) = 2$  and  $f'(x) = x^2 - 3$

find

(a)  $f(2)$ .

(3)

(b)  $f''(3)$ .

(1)

(c)  $f(x)$  when  $f''(x) = 0$ .

(1)

7. (7 marks)

(a) Express  $\int_x^1 \cos(3t) dt$  as a function of  $x$ .

(2)

(b) Find  $\frac{dx}{dt} \left( \int_x^1 \cos(3t) dt \right)$ .

(2)

(c) Solve  $\frac{dx}{dt} \left( \int_x^1 \cos(3t) dt \right) = -1$  for  $0 \leq x \leq \pi$ .

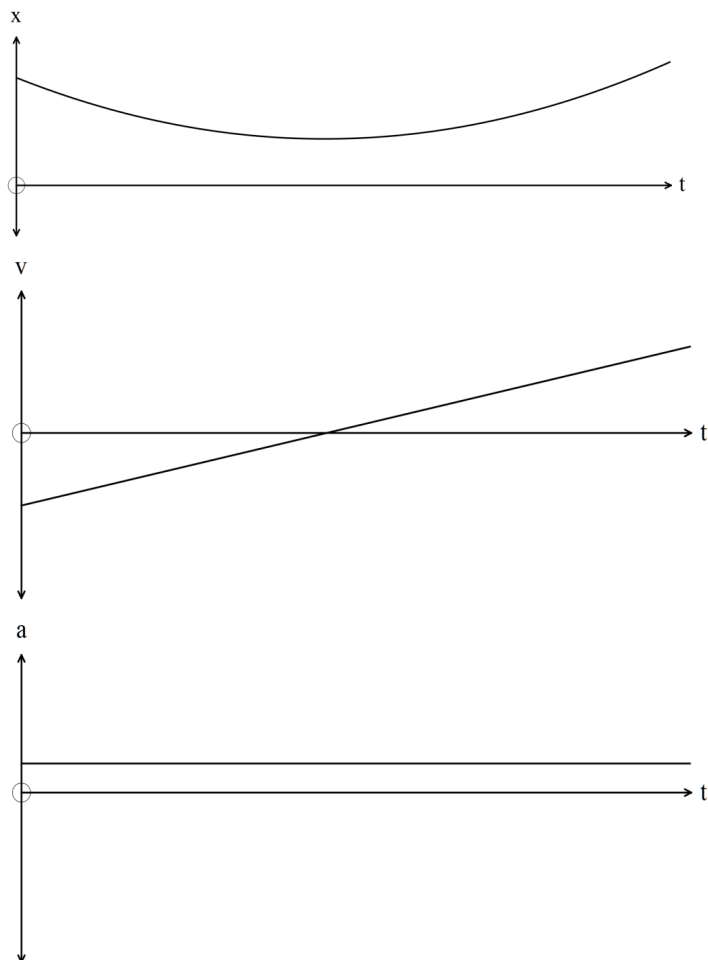
(3)

END OF SECTION ONE

2. (9 marks)

A particle is moving with displacement  $x = (t-2)(t-3)$  metres with  $t$  is measured in seconds.

The displacement – time graph of the function is shown below together with the velocity-time graph and acceleration-time graph.



6. (7 marks)

Given  $f(x) = x^2$ ,  $g(x) = e^x$  and  $h(x) = \sin(x)$

(a) (i) find the expression for expression for  $y = f(h(x))$  (1)

(ii) hence evaluate  $\frac{dy}{dx}$  at  $x = \frac{\pi}{4}$ . (2)

(b) (i) find the expression for  $y = g(f(x))$  (2)

(ii) hence evaluate  $\frac{dy}{dx}$  at  $x = \frac{1}{\sqrt{2}}$ . (2)

(a) (i) Find the velocity equation and hence find  $t$  when  $v = 0$ . (3)

(a)  $\int_1^0 \sqrt{x} \, dx$  (2)

Evaluate the following

5. (8 marks)

(c)  $\int_{\pi/4}^{\pi/2} 2 \cos 2z \, dz$

(3)

(b)  $\int_2^1 \left( \frac{1}{x^2} + 2x^3 - 4 \right) dx$

(3)

(b) Explain the relationship between the three graphs where  $v = 0$ .

(3)

(iii) Find the acceleration equation and referring to the  $x-t$  and  $v-t$  graphs, explain why the acceleration is always constant.

(3)

3. (8 marks)

Given the functions  $f(x) = e^x (\sin(\pi x))$  and  $g(x) = \frac{x^2}{\tan(x)}$

(a) find the derivative of

(i)  $y = f(x)$ . (2)

(ii)  $y = g(x)$ . (2)

(b) Hence evaluate

(i)  $f'(1)$ . (2)

(ii)  $g'\left(\frac{\pi}{4}\right)$ . (2)

4. (6 marks)

(a) Simplify  $\int (3x^2 + 4x^3 - 2) dx$  (1)

(b) Given  $y = x \sin(x)$ 

(i) find  $\frac{dy}{dx}$ . (2)

(ii) hence find  $\int x \cos(x) dx$  (3)