



PERTH MODERN SCHOOL
Exceptional schooling. Exceptional students.
Independent Public School

Year 12 Methods

TEST 2

Monday 8 April 2019

TIME: 45 minutes working

No notes allowed

Calculator Assumed

42 marks 5 Questions

Name: _____ Teacher: _____

Note: All part questions worth more than 2 marks require working to obtain full marks.

Question 1

(5 marks)

(a) Differentiate $\frac{x}{e^x}$.

(2 marks)

(b) Using your result from (a) above and **without the use** of a classpad, show how to determine the

definite integral $\int_0^1 \frac{1-x}{2e^x} dx$.

(4

marks)

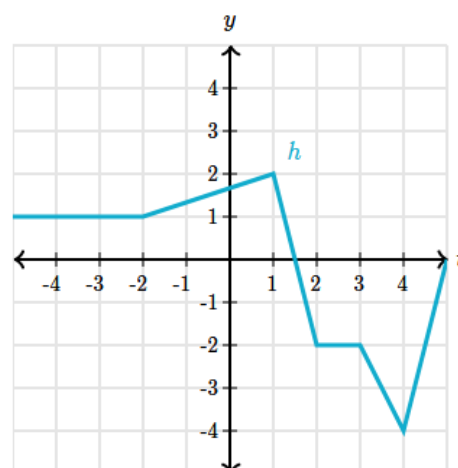
Question 2**(8 marks)**

The graph of $h(x)$ is shown on the right.

(a) Evaluate the following definite integrals

(i) $\int_{-2}^1 h'(x) dx$ (2 marks)

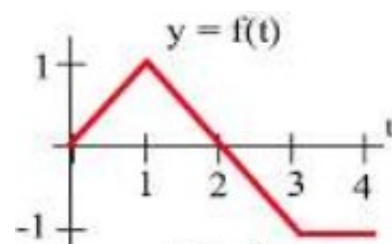
(ii) $\int_{-2}^4 h'(x) dx$ (2 marks)



(b) Determine the area bounded by the graph of $h'(x)$ and the x axis between $x = -2$ and $x = 4$. Justify your answer. (4 marks)

Question 3**(9 marks)**

$A(x) = \int_0^x f(t) dt$ for $f(x)$ in the picture on the right.



- (a) Determine the value of x for a maximum of $A(x)$. Briefly explain your reason. (3 marks)

- (b) Evaluate $A(3)$. (2 marks)

- (c) Determine the value of x for a maximum of $A'(x)$. Briefly explain your reason. (2 marks)

- (d) Evaluate $A'(4)$. (2 marks)

Question 4**(10 marks)**

A new substance labelled **XX** is found to decay by the rule $N = 1200e^{-0.116t}$, where N equals the mass of the substance in kilograms at time t minutes.

Determine the following:

- a) the initial mass of **XX**. (1 mark)
- b) the time taken for half of the mass to decay away to the nearest minute. (3 marks)

The radiation is dangerous to humans when the rate of decay is greater than 100km per minute.

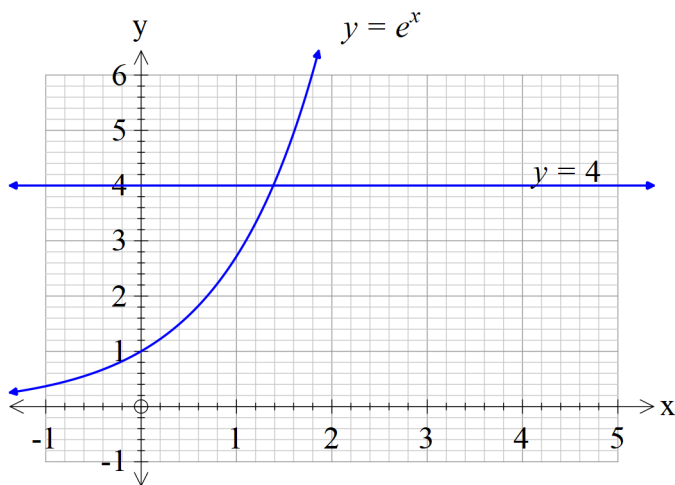
- c) Determine after what time the radiation will be safe for humans. (3 marks)

A different substance **YY** has a rate of decay given by $\frac{dN}{dt} = -50e^{-0.447t}$, where N equals the mass of the substance in kilograms at time t minutes.

- d) Determine the total change in the mass from $t = 3$ to $t = 7$ minutes. (3 marks)

Question 5

(9 marks)



- a) Using the solve facility on your classpad, determine to 2 decimal places the x value where the two graphs above intersect. (2 marks)

- b) Determine to two decimal places the area bounded by $y = e^x, y = 4$ and the y axis. (3 marks)

- c) Let $y = k$ where $1 \leq k \leq 4$, determine the value of k , to two decimal places, such that the area between $y = 4, y = k, y = e^x$ and the y axis equals 1.5 sq units. (4 marks)