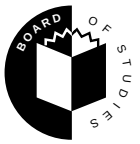
SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

Figures										**Letter**
Words										



Victorian Certificate of Education 1998

MATHEMATICAL METHODS

Common Assessment Task 2: Written examination (Facts, skills and applications task)

Thursday 5 November 1998: 9.00 am to 10.45 am
Reading time: 9.00 am to 9.15 am
Writing time: 9.15 am to 10.45 am
Total writing time: 1 hour 30 minutes

PART II

QUESTION AND ANSWER BOOK

Directions to students

This task has two parts: Part I (multiple-choice questions) and Part II (short-answer questions).
Part I consists of a separate question book and must be answered on the answer sheet provided for multiple-choice questions.
Part II consists of this question and answer book.
You must complete **both** parts in the time allotted. When you have completed one part continue immediately to the other part.
A detachable formula sheet for use in both parts is in the centrefold of the Part I question book.

At the end of the task
Place the answer sheet for multiple-choice questions (Part I) inside the front cover of this question and answer book (Part II).

Structure of book

Number of questions	*Number of questions to be answered*	*Number of marks*
6	6	17

Directions to students

Materials
Question and answer book of 8 pages, including one blank page for rough working.
You may bring to the CAT up to four pages (two A4 sheets) of pre-written notes.
You may use an approved scientific and/or graphics calculator, ruler, protractor, set-square and aids for curve-sketching.

The task
Detach the formula sheet from the centre of the Part I book during reading time.
Ensure that you write your **student number** in the space provided on the cover of this book.
The marks allotted to each question are indicated at the end of the question.
There is a total of 17 marks available for Part II.
You need not give numerical answers as decimals unless instructed to do so. Alternative forms may involve, for example, π, e, surds or fractions. A decimal approximation will not be accepted if an exact answer is required to a question.
Calculus must be used to evaluate derivatives and definite integrals. A decimal value, no matter how accurate, will not be rewarded unless the appropriate working is shown.
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
All written responses should be in English.

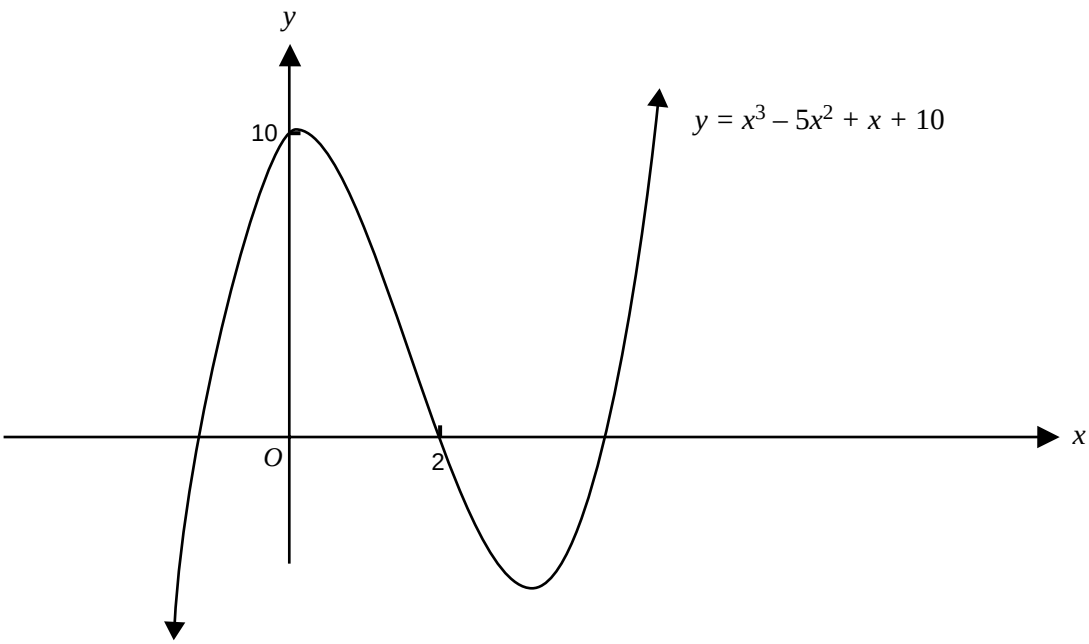
At the end of the task
Place the answer sheet for multiple-choice questions (Part I) inside the front cover of this question and answer book (Part II).

Specific instructions to students

Answer **all** questions in this part in the spaces provided.

Question 1

The graph of the relation $y = x^3 - 5x^2 + x + 10$ is shown below.



a. Write the relation in the form

$$y = (x - a)(x^2 + bx + c)$$

1 mark

b. **Hence** find where the graph cuts the x-axis.

2 marks

Total 3 marks

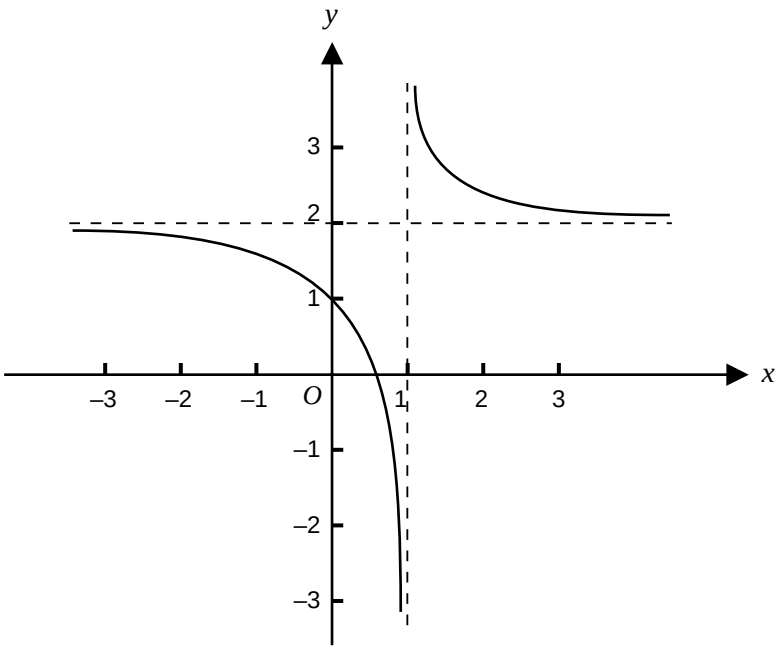
Question 2

Find the value of x in terms of a for which $2\log_a x = 2 + \log_a 9$, where $a > 0$ and $x > 0$.

2 marks

Question 3

The graph of the function $f: R \setminus \{1\} \to R$, where $f(x) = \frac{1}{x-1} + 2$ is shown below.



a. Clearly state why f^{-1} exists.

1 mark

b. **i.** Write down the domain of f^{-1}.

1 mark

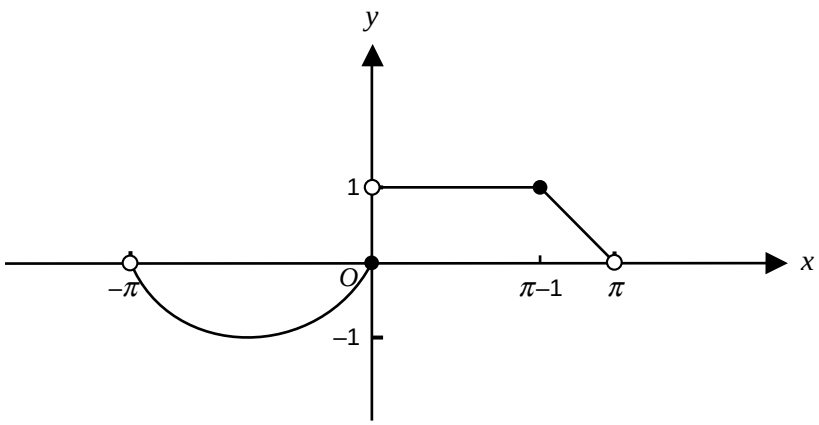
ii. Write down the rule for f^{-1} in the form $f^{-1}(x) = \frac{A}{x+b} + B$, where A, B and b are constants.

1 mark

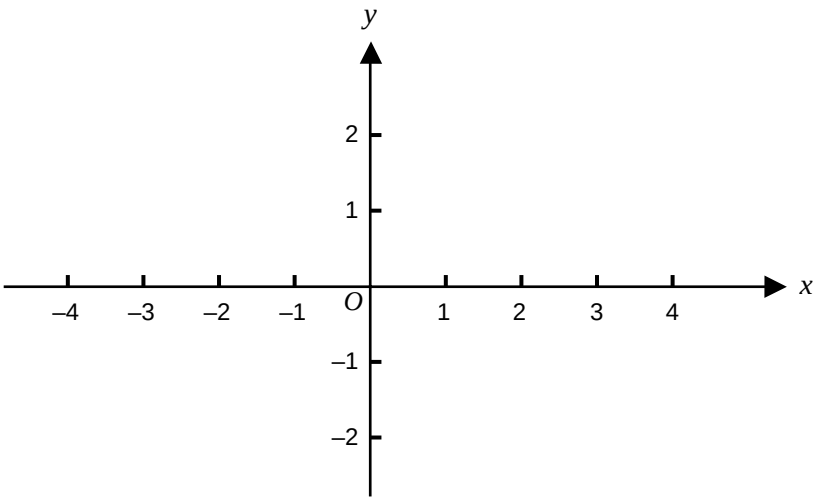
Total 3 marks

Question 4

The graph of the function f is shown below.



Sketch the graph of the derived function f' on the set of axes below.



2 marks

Question 5

The number of customers, X, waiting to be served in a florist shop at 6 pm has a probability distribution given by

X	0	1	2	3
$p(x)$	$\frac{2k^2-1}{9}$	$\frac{4k}{9}$	$\frac{3k}{9}$	$\frac{k}{9}$

a. Find the value of k.

2 marks

b. Determine the expected number of customers waiting to be served in the florist shop at 6 pm each day, correct to two decimal places.

1 mark

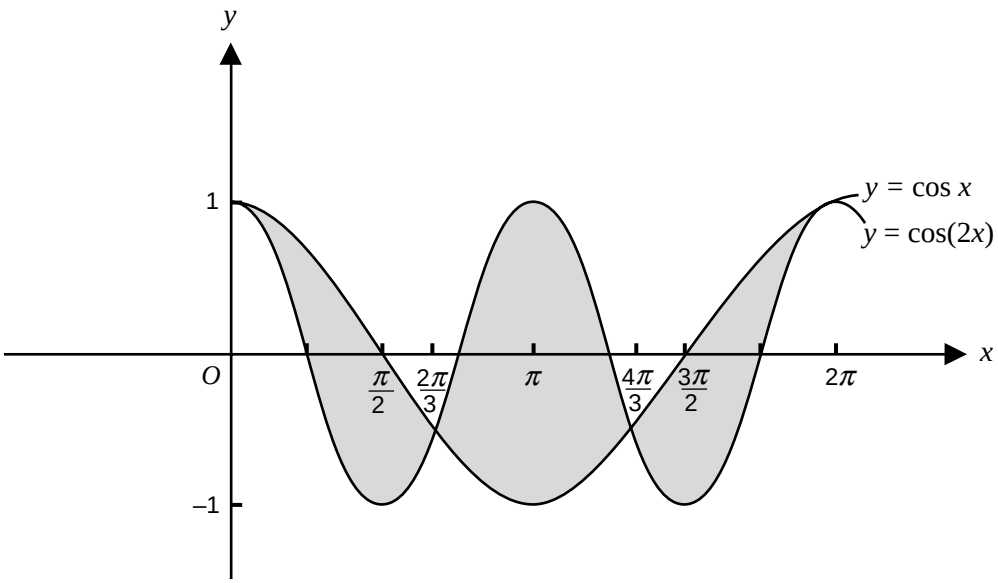
c. Calculate the probability that the number of customers waiting to be served in the florist shop at 6 pm each day is no more than 2, correct to two decimal places.

1 mark

Total 4 marks

Question 6

Use calculus to find the exact area of the region bounded by the graphs with equations $y = \cos x$ and $y = \cos(2x)$ for $x \in [0, 2\pi]$, as shaded in the diagram below.



3 marks

Working space

END OF PART II QUESTION AND ANSWER BOOK