

Student Name: _____

MATHEMATICAL METHODS (CAS)

Unit 1 – Written examination 1



2007 Trial Examination

Reading Time: 15 minutes

Writing Time: 1 hour

QUESTION AND ANSWER BOOK

Structure of Book

<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
10	10	40

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers.
- Students are NOT permitted to bring into the examination room: notes of any kind, blank sheets of paper, white out liquid/tape or a calculator of any type.

Materials supplied

- Question and answer book of 9 pages.
- Working space is provided throughout the book.

Instructions

- Print your name in the space provided on the top of this page.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

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Instructions

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

A decimal approximation will not be accepted if an **exact** answer is required to a question.

In questions where more than one mark is available, appropriate working must be shown.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

A rainwater tank is being filled due to a long, steady downpour. The tank can hold 2500 litres, but before the rain started it already had 150 litres left in it. The tank is filling at 25 litres a minute. Assume that the rain will last indefinitely.

- a. Write down a rule for the volume of the tank $V(t)$.

1 mark

- b. How many litres will be in the tank after an hour?

1 mark

- c. How many minutes will pass before the tank becomes full?

1 mark

- d. The tank springs a leak, and 15 litres a minute are now pouring out of it. Write down the new rule for $V(t)$.

1 mark

TURN OVER

Question 2

- a.** Using polynomial long division, determine the quotient and remainder from of

$$\frac{x^3 - 7x^2 + 5x - 8}{x - 1}.$$

3 marks

- b.** Verify that the remainder found in **part a** is correct by substituting $x = 1$ into the cubic.

1 mark

Question 3

A mixed cricket squad must consist of 3 more girls than boys, and it must have between 11 and 15 members inclusive.

- a.** Construct an equation using inequalities that contains the above information. Let n be the number of boys on the team.

2 marks

- b.** Determine how many boys can be on the team.

2 marks

Question 4

Julie is purchasing 6 oranges and 4 bananas for \$7, whereas Daniel is purchasing 2 oranges and 7 bananas for \$8. Assume that they are charged per item, not per weight.

- a. Create a pair of simultaneous equations to model this scenario.

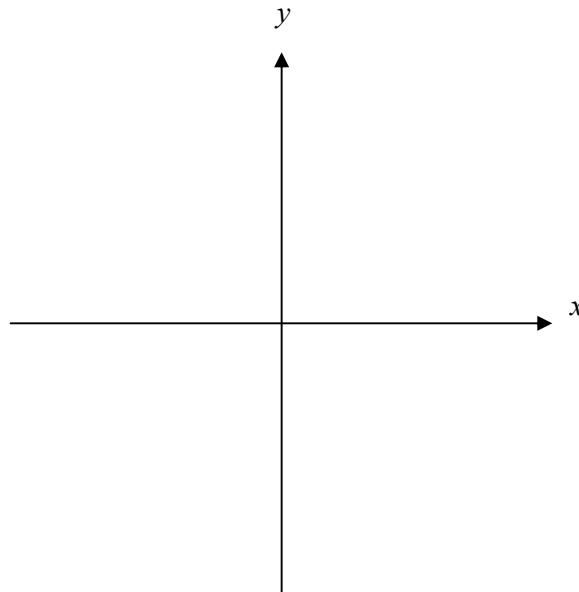
2 marks

- b. Determine the actual cost of each orange and each banana.

2 marks

Question 5

- a. Graph the function $\{(x, y) : y = x^2 - 4, x \in (-1, 3]\}$ on the axes provided, indicating intercepts and any other points of interest.



3 marks

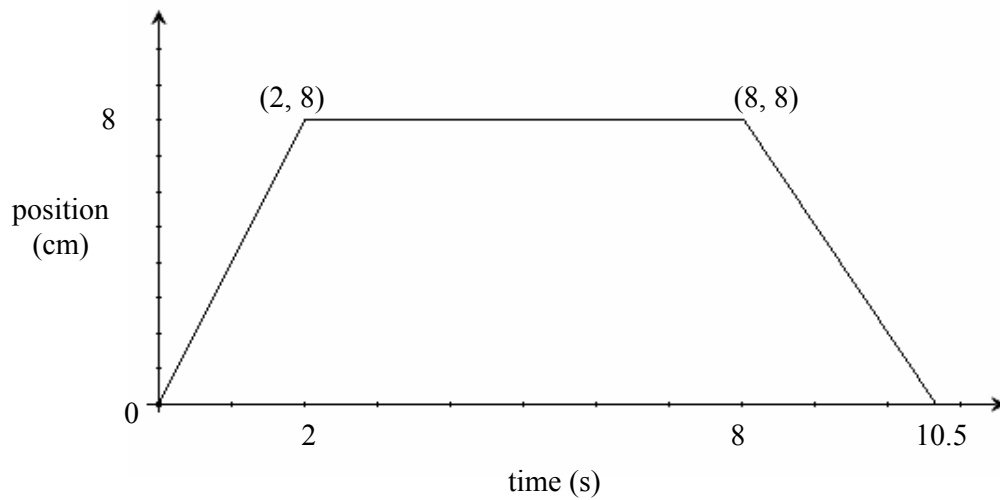
- b. Determine the range of the function.

1 mark

TURN OVER

Question 6

Consider the following graph, showing the movement of an object relative to its origin.



- a. Determine the equation of the function that describes this motion, $x(t)$.

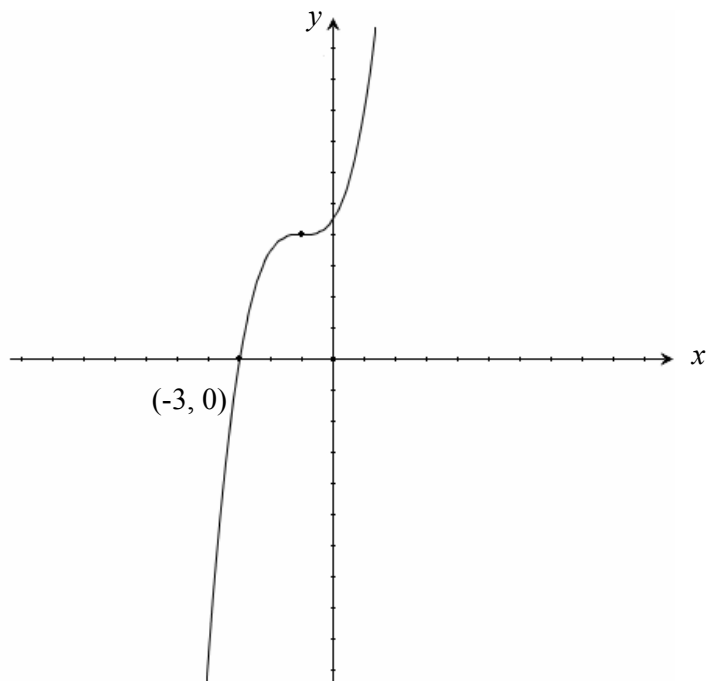
4 marks

- b. What is the object's position after 10 seconds?

1 mark

Question 7

Consider the following graph, which has an equation of the form $y = a(x - h)^3 + k$.



Determine the values of a , h and k .

3 marks

TURN OVER

Question 8

Determine the average rate of change of the function $y = 4x^2 - 6x + 3$ over $-2 \leq x \leq 4$.

3 marks

Question 9

A six-sided die is rolled twice.

a. Complete the lattice diagram.

		Roll 1					
		1	2	3	4	5	6
Roll 2	1						
	2						
	3						
	4						
	5						
	6						

3 marks

b. Determine the probability of rolling two numbers which add up to at least 9 using your lattice diagram in **part a**.

2 marks

Question 10

Two factories make 'bargain basement' light globes. Between the two, factory X makes 25% of these globes overall. However, due to cutting corners, a large number of these globes are faulty. 40% of factory X 's globes are faulty, and 30% of factory Y 's globes are faulty.

- a. Construct a tree diagram showing the information, including probability values at each branch. A key to the diagram is essential.

2 marks

- b. Determine the probability overall that a globe will be faulty.

2 marks

END OF QUESTION AND ANSWER BOOK