

INSIGHT

Trial Exam Paper

2007

SPECIALIST MATHEMATICS

Written examination 1

STUDENT NAME:

QUESTION AND ANSWER BOOK

Reading time: 15 minutes

Writing time: 1 hour

Structure of book

<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
9	9	40

- Students are permitted to bring the following items into the examination: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring sheets of paper, notes of any kind or white out liquid/tape into the examination.
- Calculators are not permitted in this examination.

Materials provided

- The question and answer book of 11 pages with a separate sheet of miscellaneous formulas.
- Working space is provided throughout this book.

Instructions

- Write your **name** in the box provided.
- Remove the formula sheet during reading time.
- You must answer the questions in English.

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

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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.

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

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

Take the **acceleration due to gravity** to have magnitude $g \text{ m/s}^2$, where $g = 9.8$

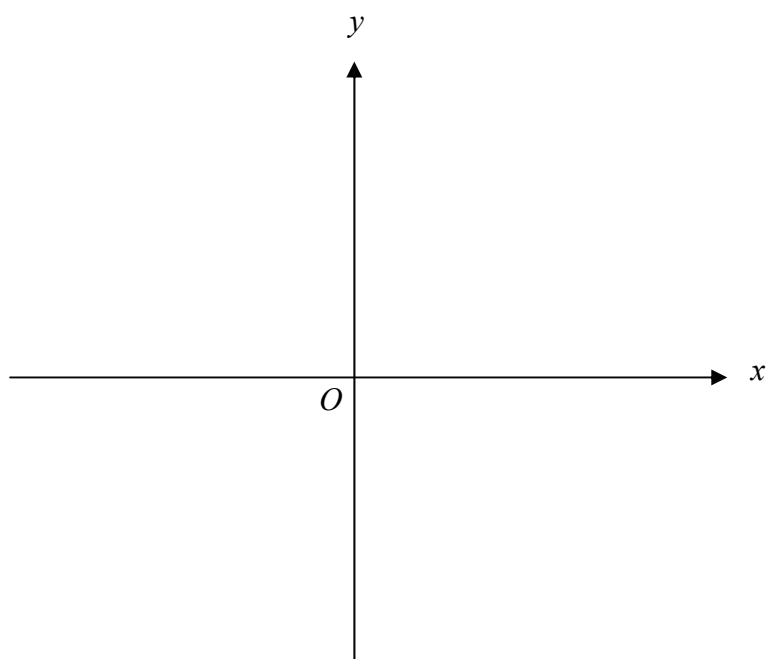
Question 1

Let $x = \sqrt{t+4}$ and $y = 1 - t$ for $-4 \leq t \leq 4$.

- a. Find the Cartesian equation of the curve.

2 marks

- b. Sketch a graph of the curve, showing all features clearly.



2 marks

Question 2

Express $(\sqrt{3} - i)^7$ in the form $x + iy$ where $x, y \in \mathbb{R}$.

4 marks

Question 4

a. Show that $\frac{\sin(x)}{1 - \cos(x)} = \cot\left(\frac{x}{2}\right)$.

2 marks

b. Hence or otherwise, solve the equation $\sin(x) = \cos(x) - 1$ over $0 \leq x \leq 2\pi$.

2 marks

Question 5

The position of a particle at time t seconds, $t \geq 0$, is given by the vector $\mathbf{r} = t\mathbf{i} + (1 - 2t)\mathbf{j} + (t - 6)\mathbf{k}$. Find the time when the particle's velocity vector is perpendicular to its position vector.

3 marks

Question 6

Consider the relation $xy + \frac{y^2}{x} = 2$.

- a.** Find an expression for $\frac{dy}{dx}$ in terms of x and y .

3 marks

- b. Hence** find the equations of the tangents to the curve when $x = 1$.

3 marks

TURN OVER

Question 7

$$f : D \rightarrow R, \quad f(x) = \arccos\left(\frac{1}{\sqrt{x}}\right)$$

- a.** Determine the domain D of function f .

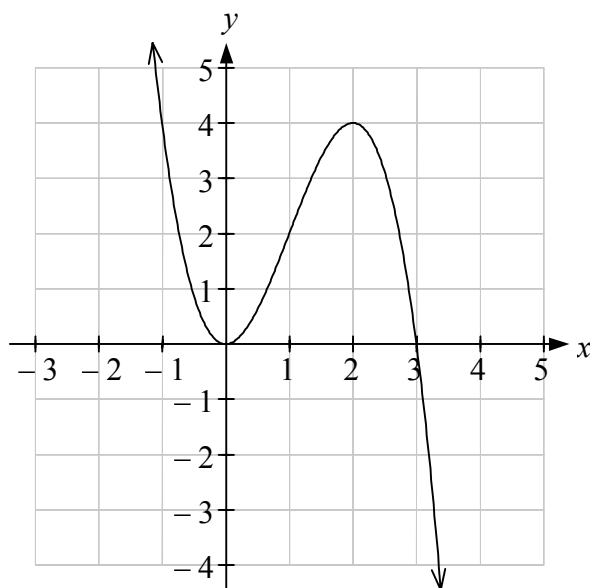
1 mark

- b.** Find $f'(x)$.

3 marks

Question 9

The graph of $f(x) = 3x^2 - x^3$ is shown on the axes below.



- a. Draw the graph of $g(x) = \frac{1}{3x^2 - x^3}$ on the axes above, showing all features clearly.

2 marks

- b. Given $\frac{1}{3x^2 - x^3} = \frac{Ax + B}{x^2} + \frac{C}{3 - x}$, find the exact values of A , B , and C .

2 marks

- c. Find the exact area between the graph of $g(x) = \frac{1}{3x^2 - x^3}$, the x -axis and the lines $x = 1$ and $x = 2$.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

3 marks

END OF QUESTION AND ANSWER BOOK