

ERUVIO MENTORING · EXTERNAL-STYLE EXAMINATION

Specialist Mathematics

Units 3 and 4 · Induction, vectors, matrices and complex numbers; integration, differential equations and statistical inference

Paper 1 · Section 1

MULTIPLE CHOICE · 10 MARKS

STUDENT DETAILS

GIVEN NAME(S)

FAMILY NAME

SCHOOL

DATE

BOOK OF

DO NOT WRITE ON THIS PAGE

Structure of this examination

PAPER	SECTION	QUESTION TYPE	TIME	MARKS
Paper 1 TECHNOLOGY-FREE	Section 1	Multiple choice, 10 questions	5 min perusal 90 min working	10
	Section 2	Short response, 9 questions		55
Paper 2 TECHNOLOGY-ACTIVE	Section 1	Multiple choice, 10 questions	5 min perusal 90 min working	10
	Section 2	Short response, 9 questions		55
Total		38 questions	190 minutes	130

Degree of difficulty

Every question in this examination is tagged with its degree of difficulty. The tag appears in brass beside the marks.

DEGREE OF DIFFICULTY	MARKS	PROPORTION
Simple familiar SF	78	60%
Complex familiar CF	26	20%
Complex unfamiliar CU	26	20%
Total	130	100%

Instructions

- **Perusal time: 5 minutes. Working time: 90 minutes.**
- **This is the technology-free paper.** Calculators, notes and the formula book may not be used.
- Write using black or blue pen. Planning paper will not be marked.
- All questions are drawn from Unit 3 (mathematical induction, and further vectors, matrices and complex numbers) and Unit 4 (integration, differential equations and statistical inference).
- **Each question is tagged with its degree of difficulty** in brass beside the marks: **SF** simple familiar, **CF** complex familiar, **CU** complex unfamiliar.
- **Section 1 contains 10 multiple choice questions.** Choose the best answer for each and record it on the response grid provided.

Answers must be recorded on the response grid on the final page. Marks are not deducted for incorrect answers, so attempt every question.

1 If $\mathbf{a} = i + 2j + 3k$ and $\mathbf{b} = 2i - j + k$, then $\mathbf{a} \times \mathbf{b}$ equals

- A $5i - 5j + 5k$
- B $3i + j + 2k$
- C $-5i - 5j + 5k$
- D $5i + 5j - 5k$

2 $\int 2x \cos(x^2) dx$ equals

- A $2 \sin(x^2) + c$
- B $\sin(x^2) + c$
- C $-\sin(x^2) + c$
- D $x^2 \sin(x^2) + c$

3 The value of $(1 + i)^4$ is

- A -4
- B $4i$
- C $-4i$
- D 4

4 $\int 1/(1 + x^2) dx$ equals

- A $\ln(1 + x^2) + c$
- B $\sin^{-1}(x) + c$
- C $\tan^{-1}(x) + c$
- D $1/2x + c$

5 The general solution of $dy/dx = ky$ is

- A $y = kx + c$
- B $y = e^{kx} + c$
- C $y = A + e^{kx}$
- D $y = Ae^{kx}$

6 The magnitude of $3i + 4j + 12k$ is

- A 12
- B 13
- C 19
- D 169

- 7 To prove by induction that $1 + 2 + \cdots + n = (n(n + 1))/2$, the base case is
- A $n = 0$, giving $0 = 0$.
 - B $n = 2$, giving $3 = 3$.
 - C $n = 1$, giving $1 = 1$.
 - D the assumption that the statement holds for $n = k$.
- 8 The value of $\int_0^1 e^{2x} dx$ is
- A $(e^2 - 1)/2$
 - B $(e - 1)/2$
 - C $e^2/2$
 - D $e^2 - 1$
- 9 In the Argand plane, the solutions of $z^3 = 1$ are
- A three points lying on a straight line.
 - B two points only, one of which is real.
 - C a single real point.
 - D three points equally spaced on a circle of radius 1 centred at the origin.
- 10 The region under $y = \sqrt{x}$ from $x = 0$ to $x = 4$ is rotated about the x axis. The volume generated is
- A 4π
 - B 8π
 - C 16π
 - D $64\pi/3$

Response grid

Shade or cross the box for your chosen answer

Question	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

END OF SECTION 1