



**Test Papers
Hub.**

VCE Mathematical Methods Practice Paper 1

Units 3 & 4 — Practice Examinations 1 & 2

Exam 1: 10 short-answer questions (40 marks) · Exam 2: 20 multiple-choice + 5 extended-response (80 marks) · 120 marks in all

How to use this booklet

- This paper contains BOTH examinations for a complete practice sitting. Examination 1 is technology-free (1 hour); Examination 2 allows an approved CAS calculator and one bound reference (2 hours).
- Exam 2 Section A has 20 multiple-choice questions (A–D); Section B has 5 extended-response questions. A formula sheet is assumed to be provided, as in the real examination.
- Show all working where more than one mark is available. Worked solutions, with a key takeaway for every question, follow the papers.

EXAMINATION 1 (TECHNOLOGY-FREE)

40 marks · 1 hour · No calculator or notes

Attempt Questions 1 – 10. Answer all questions in the spaces provided and show your working.

Question 1 (2 marks)

- (a) Differentiate $y = \ln(x^2 + 4)$ with respect to x . [1 mark]

- (b) Hence find the gradient of the curve at $x = 0$. [1 mark]

Question 2 (4 marks)

- (a) Find an antiderivative of $e^{(5x)} + 4$. [2 marks]

- (b) Hence evaluate the definite integral $\int$ from 0 to 1 of $(e^{(5x)} + 4) dx$. [2 marks]

Question 3 (3 marks)

- (a) Given that $x = -3$ is a solution of $x^3 - 2x^2 - 11x + 12 = 0$, find all solutions.

Question 4 (4 marks)

- (a) State the maximal domain of $f(x) = \sqrt{(5x + 3)} - 2$. [2 marks]

(b) State the range of f . [2 marks]

Question 5 (4 marks)

(a) Find the equation of the normal to the graph of $y = x + e^x$ at $x = 1$.

Question 6 (4 marks)

(a) Find the exact area bounded by $y = e^{2x} + 2$, the x -axis, $x = 0$ and $x = 1$.

Question 7 (4 marks)

(a) The probability distribution of X is: $x: 0, 1, 2, 3$ with $\Pr(X = x): \frac{1}{5}, \frac{3}{10}, \frac{2}{5}, m$. Find m . [1 mark]

(b) Find $E(X)$. [1 mark]

(c) Find $\text{Var}(X)$. [2 marks]

Question 8 (4 marks)

(a) The continuous random variable X has probability density function $f(x) = kx^2$ for $0 \leq x \leq 5$, and $f(x) = 0$ elsewhere. Find the value of k . [2 marks]

WORKED SOLUTIONS

Answers & worked solutions

Multiple-choice answer key

1	C	2	D	3	C	4	B	5	A	6	C
7	D	8	D	9	B	10	A	11	B	12	A
13	A	14	C	15	B	16	A	17	C	18	D
19	B	20	D								

EXAMINATION 1 (TECHNOLOGY-FREE)

Question 1 (2 marks) [Chain rule]

(a) Answer: $\frac{dy}{dx} = 2x/(x^2 + 4)$

- Chain rule: the derivative of $\ln g$ is g'/g .
- $g = x^2 + 4$, $g' = 2x$.
- $f'(x) = 2x/(x^2 + 4)$.

(b) Answer: 0

- Substitute $x = 0$ into dy/dx .
- Gradient = 0.

LOS: Methods: differentiation

KEY TAKEAWAY

$$\frac{d}{dx} \ln g(x) = g'(x)/g(x).$$

Question 2 (4 marks) [Antidifferentiation]

(a) Answer: $F(x) = 4x + e^{(5x)/5} + c$

- The antiderivative of $e^{(kx)}$ is $e^{(kx)}/k$; the antiderivative of a constant b is bx .
- An antiderivative is $F(x) = 4x + e^{(5x)/5} (+ c)$.

(b) Answer: $\frac{19}{5} + e^5/5$

- Evaluate $F(1) - F(0)$.
- $= \frac{19}{5} + e^5/5$.

LOS: Methods: integration

KEY TAKEAWAY

Antidifferentiate by reversing the differentiation rules, then evaluate $F(b) - F(a)$ for a definite integral.