EXAM PAPER

Maths Methods Unit 3 & 4 — Examination 1 (Practice 1)

Reading time: 15 minutes (no writing)
Writing time: 60 minutes

Total time: 75 minutes

SECTIONS IN THIS PAPER

- Examination 1 — technology-free — 60 min (no calculator)

INSTRUCTIONS

You are not permitted to write during reading time — you may only read the paper and plan your approach. Answer every question you can. Write your working in the space provided for long-answer questions. Marking guidance and full explanations are provided in the separate answer key.

Examination 1 — technology-free

60 minutes • No calculator

Question 1 (4 marks)

This question is about differentiation and antidifferentiation.

a. Let $y = x^2e^{3x}$. Find dy/dx. 2 marks

b. Let $f'(x) = (2x - 3)^4$. Find $f(x)$, given that $f(2) = 1$. 2 marks

Question 2 (3 marks)

The graph of $y = m/(x - a) + c$ has a vertical asymptote at $x = 2$, a y-intercept at $(0, 3)$ and an x-intercept at $(-1, 0)$, where a, c and m are integers.

a. State the value of a. 1 mark

b. Find the values of m and c. 2 marks

Question 3 (5 marks)

The discrete random variable X has the probability distribution shown below.

x:	0	1	2	3
Pr(X = x):	0.1	0.3	k	0.2

a. Find the value of k. 1 mark

b. Find E(X). 2 marks

c. Find $\Pr(X \geq 2 \mid X \geq 1)$. 2 marks

Question 4

(4 marks)

Consider the function with rule $y = 2\sin(3x)$.

a. State the period of the function. 1 mark

b. Solve $2\sin(3x) = \sqrt{3}$ for x, where $x \in [0, \pi]$. 3 marks

Question 5

(5 marks)

Let $f(x) = 3x^2 - 6x$.

a. Find the x-intercepts of the graph of f. 2 marks

b. Find the area of the region enclosed by the graph of f and the x-axis. 3 marks

Question 6

(4 marks)

Let $f: (1, \infty) \to R$, $f(x) = 2\log_e(x - 1)$.

a. Find the rule for f^{-1}. 2 marks

b. State the domain and range of f^{-1}. 2 marks

Question 7

(5 marks)

Let $f(x) = x^3 - 4x$.

a. Find the equation of the tangent to the graph of f at $x = 1$. 2 marks

b. Find the coordinates of the other point where this tangent meets the graph of f. 3 marks

Question 8

(5 marks)

This question concerns exponential and logarithmic equations.

a. Solve $2^{2x} - 5(2^x) + 4 = 0$ for x. 2 marks

b. Solve $\log_e(x) + \log_e(x - 3) = \log_e(4)$ for x. 3 marks

Question 9

(5 marks)

The continuous random variable X has probability density function $f(x) = kx$ for $0 \leq x \leq 4$, and $f(x) = 0$ elsewhere.

a. Find the value of k. 2 marks

b. Find Pr($X \leq 2$). 3 marks