Mathematical Methods Unit 3 & 4 — Examination 1 (Practice 2) — Answers & Explanations

Answers to the 5 questions in the free preview.

Examination 1 — technology-free

1. (4 marks in total)

a. $dy/dx = e^{2x}(2\sin(x) + \cos(x))$ [2 marks]

Product rule with $u = e^{2x}$ and $v = \sin(x)$: $dy/dx = 2e^{2x}\sin(x) + e^{2x}\cos(x)$. One mark for the product rule, one for the correct result in any equivalent form.

b. $g'(2) = -3/25$ [2 marks]

Quotient rule: $g'(x) = ((x^2 + 1) - 2x^2)/(x^2 + 1)^2 = (1 - x^2)/(x^2 + 1)^2$. Then $g'(2) = (1 - 4)/25 = -3/25$. One mark for the derivative, one for the value.

2. (3 marks in total)

a. $(1/2)\log_e(2x + 1)$ [1 mark]

Using $\int 1/(ax + b)\,dx = (1/a)\log_e(ax + b)$, an antiderivative is $(1/2)\log_e(2x + 1)$.

b. $\sqrt{3}/4$ [2 marks]

An antiderivative is $(1/2)\sin(2x)$. $[(1/2)\sin(2x)]$ from 0 to $\pi/6 = (1/2)\sin(\pi/3) - 0 = (1/2)(\sqrt{3}/2) = \sqrt{3}/4$. One mark for the antiderivative, one for the value.

3. (5 marks in total)

a. $x = 5\pi/6$ or $x = 7\pi/6$ [2 marks]

$\cos(x) = -\sqrt{3}/2$. The reference angle is $\pi/6$, and cosine is negative in the second and third quadrants: $x = \pi - \pi/6 = 5\pi/6$ and $x = \pi + \pi/6 = 7\pi/6$. One mark for each solution.

b. Endpoints (0, 1) and (π, 1); maximum (π/4, 4); minimum (3π/4, −2). One full cycle of a sine curve with amplitude 3 about $y = 1$. [3 marks]

The period is $2\pi/2 = \pi$, so one cycle is drawn. The amplitude 3 about the centre line $y = 1$ gives a maximum of 4 at $x = \pi/4$ and a minimum of −2 at $x = 3\pi/4$. One mark for shape and period, one for the turning points, one for the endpoints.

4. (5 marks in total)

a. 2/15 [1 mark]

Pr(both red) = (4/10) × (3/9) = 12/90 = 2/15.

b. 8/15 [2 marks]

Pr(red then blue) + Pr(blue then red) = (4/10)(6/9) + (6/10)(4/9) = 48/90 = 8/15. One mark for recognising both orders, one for the answer.

c. 36/125 [2 marks]

$X \sim Bi(3, 2/5)$. $Pr(X = 2) = {}^3C_2\,(2/5)^2\,(3/5) = 3 \times 4/25 \times 3/5 = 36/125$. One mark for the binomial set-up, one for the value.

5. (4 marks in total)

a. $y = 2x - 4$ [2 marks]

$f(3) = 9 - 12 + 5 = 2$ and $f'(x) = 2x - 4$, so $f'(3) = 2$. The tangent is $y - 2 = 2(x - 3)$, that is $y = 2x - 4$. One mark for the gradient, one for the equation.

b. 4 square units [2 marks]

The tangent $y = 2x - 4$ meets the x-axis at A(2, 0) and the y-axis at B(0, −4). Area = (1/2) × 2 × 4 = 4. One mark for both intercepts, one for the area.

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PREVIEW

That’s the end of the preview answers

These are the answers to the 5 preview questions. The full answer key covers all 9 questions in Mathematical Methods Unit 3 & 4 — Examination 1 (Practice 2), with the working behind every mark.

STILL TO COME	QUESTIONS	MARKS
Examination 1 — technology-free	4	19

The full paper comes with

- Every question, printed exactly like the ones in this preview
- The complete answer key, with the working behind every mark
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