Mathematical Methods Unit 1 & 2 — Practice Exam 2 — Answers & Explanations

Answers to the 15 questions in the free preview.

Mathematical Methods

1. B. The gradient of the tangent to the curve at x = a

The derivative evaluated at a point gives the gradient of the tangent line to the curve at that point.

2. B. 0

f'(x) = 2x − 4. At x = 2: f'(2) = 2(2) − 4 = 0.

3. D. f'(x) = −1/x²

Writing f(x) = x⁻¹ and applying the power rule: f'(x) = −1·x⁻² = −1/x².

4. C. f'(x) = 8x + 4

Expanding: f(x) = 4x² + 4x + 1. Differentiating: f'(x) = 8x + 4.

5. A. f'(x) = 0

A stationary point occurs where the gradient of the curve is zero, i.e. where f'(x) = 0.

6. D. f'(x) = ½x^(−½)

Writing f(x) = x^(1/2) and applying the power rule: f'(x) = ½x^(1/2 − 1) = ½x^(−1/2).

7. B. The rate of change of the gradient (concavity)

The second derivative measures how the gradient itself is changing, which describes the concavity of the curve.

8. See explanation below — this question is not auto-marked.

Model answer: f'(x) = 12x² − 12x + 5. At x = 1: f'(1) = 12(1) − 12(1) + 5 = 12 − 12 + 5 = 5. Award marks for correctly differentiating each term and correctly substituting x = 1.

9. See explanation below — this question is not auto-marked.

Model answer: f'(x) = 2x − 6. Setting f'(x) = 0: 2x − 6 = 0, so x = 3. f(3) = 9 − 18 + 8 = −1. The stationary point is (3, −1). Award marks for correctly finding the derivative, solving for x, and substituting back to find the y-coordinate.

10. See explanation below — this question is not auto-marked.

Model answer: f'(x) = 8x³ − 9x² + 1. f'(−1) = 8(−1)³ − 9(−1)² + 1 = −8 − 9 + 1 = −16. Award marks for correct differentiation and correct substitution of x = −1, including sign handling.

11. See explanation below — this question is not auto-marked.

Model answer: the derivative f'(x) represents the gradient of the tangent line to the curve y = f(x) at a given x-value — i.e. the instantaneous rate of change of the function. When f'(x) = 0 at a point, the tangent to the curve is horizontal at that point, indicating a stationary point (which could be a local maximum, local minimum, or a stationary point of inflection). Award marks for correctly describing the gradient interpretation and correctly describing the meaning of a zero derivative.

12. B. {1, 2, 3, 4, 5, 6}

A standard die has six faces numbered 1 to 6, so the sample space is {1, 2, 3, 4, 5, 6}.

13. C. 1/2

There are 3 even outcomes (2, 4, 6) out of 6, giving P = 3/6 = 1/2.

14. B. P(A) + P(B)

For mutually exclusive events (they cannot both occur), P(A or B) = P(A) + P(B).

15. B. 0.65

The complement rule states P(not A) = 1 − P(A) = 1 − 0.35 = 0.65.

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PREVIEW

That’s the end of the preview answers

These are the answers to the 15 preview questions. The full answer key covers all 30 questions in Mathematical Methods Unit 1 & 2 — Practice Exam 2, with the working behind every mark.

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