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

Answers to the 12 questions in the free preview.

Section A — multiple choice

1. D. 3

$f(x) = (x - 3)^2 - 4$ has its turning point at $x = 3$. The function is one-to-one, so it has an inverse, only on a domain that starts at or to the right of $x = 3$.

2. E. $x = 2$

The logarithm is undefined when $4 - 2x = 0$, that is $x = 2$, and the graph approaches this line.

3. A. $y = -f(x - 2)$

Reflecting in the x-axis gives $y = -f(x)$. Translating 2 units right replaces x with $x - 2$, giving $y = -f(x - 2)$.

4. E. $k = 3$

The determinant $k^2 - 9$ is zero when $k = \pm 3$. When $k = 3$ both equations are $3x + 3y = 6$, so there are infinitely many solutions. When $k = -3$ they become $-x + y = 2$ and $x - y = 0$, which contradict each other, so there is no solution.

5. A. $e^{3x}(3\cos(2x) - 2\sin(2x))$

Product rule: $3e^{3x}\cos(2x) + e^{3x}(-2\sin(2x)) = e^{3x}(3\cos(2x) - 2\sin(2x))$.

6. B. 1/2

$dy/dx = 2x/(x^2 + 3)$. At $x = 1$ this is $2/4 = 1/2$.

7. E. a local minimum at $x = -1$ and a stationary point of inflection at $x = 2$

$f'(x) < 0$ for $x < -1$ and $f'(x) > 0$ for $-1 < x < 2$, so there is a local minimum at $x = -1$. $f'(x) > 0$ on both sides of $x = 2$ because $(x - 2)^2$ does not change sign, so $x = 2$ is a stationary point of inflection.

8. D. 3

$\int \sin(x)\,dx$ from 0 to $\pi = 2$, and the region from π to $3\pi/2$ lies below the axis with area $|\int \sin(x)\,dx| = 1$. The total area is $2 + 1 = 3$. The signed integral from 0 to $3\pi/2$ is 1, a common wrong answer.

9. A. $1/(5\pi)$

$V = (4/3)\pi r^3$, so $dV/dt = 4\pi r^2 \times dr/dt$. With $dV/dt = 20$ and $r = 5$: $20 = 100\pi \times dr/dt$, so $dr/dt = 1/(5\pi)$.

10. C. 0.2581

$\Pr(X = 3) = {}^{12}C_3(0.25)^3(0.75)^9 = 220 \times 0.015625 \times 0.07508 = 0.2581$. 0.6488 is $\Pr(X \le 3)$ and 0.6093 is $\Pr(X \ge 3)$.

11. B. 0.0548

$z = (42 - 50) \div 5 = -1.6$, and $\Pr(Z < -1.6) = 0.0548$.

12. B. 23.42

$\Pr(X > 30) = 0.05$ means 30 is at $z = 1.6449$. So $\mu = 30 - 1.6449 \times 4 = 23.42$. Using $z = 1.96$ gives 22.16, and adding instead of subtracting gives 36.58.

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PREVIEW

That’s the end of the preview answers

These are the answers to the 12 preview questions. The full answer key covers all 24 questions in Mathematical Methods Unit 3 & 4 — Examination 2 (Practice 4), with the working behind every mark.

STILL TO COME	QUESTIONS	MARKS
Section A — multiple choice	8	8
Section B — extended response	4	60

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
- A topic report after marking, showing what to practice next

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