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

Answers to the 12 questions in the free preview.

Section A — multiple choice

1. A. [1, 5)

$\sqrt{(x - 1)}$ needs $x \geq 1$ and $\log_e(5 - x)$ needs $x < 5$. Both hold on [1, 5).

2. E. [0, 4]

The domain includes $x = 0$, where $f(0) = 0$, and $x = 2$, where $f(2) = 4$. Values near $x = -1$ approach 1, which lies inside [0, 4] anyway. The range is [0, 4]. (1, 4] comes from evaluating only the endpoints.

3. B. $\mu = 37.93$ and $\sigma = 9.42$

$\Pr(Z < -0.8416) = 0.2$ and $\Pr(Z < 1.2816) = 0.9$, so $\mu - 0.8416\sigma = 30$ and $\mu + 1.2816\sigma = 50$. Subtracting: $2.1232\sigma = 20$, so $\sigma \approx 9.42$ and $\mu \approx 37.93$. 88.73 is the variance, and 36.77 and 8.04 come from wrongly using $z = 1.645$ for the upper 10%.

4. B. 1

By the remainder theorem, $P(2) = 8 + 4k - 8 + 3 = 4k + 3 = 7$, so $k = 1$.

5. D. $6\sin^2(2x)\cos(2x)$

Chain rule twice: $d/dx[(\sin(2x))^3] = 3\sin^2(2x) \times \cos(2x) \times 2 = 6\sin^2(2x)\cos(2x)$. $3\sin^2(2x)\cos(2x)$ misses the factor of 2 from the inner function.

6. E. $1/(e - 1)$

Average rate of change $= (f(e) - f(1))/(e - 1) = (\log_e(2e) - \log_e(2))/(e - 1) = \log_e(e)/(e - 1) = 1/(e - 1)$. This is not the average value of f, which would need an integral.

7. A. $n = 20$, $p = 0.3$

$np = 6$ and $np(1 - p) = 4.2$, so $1 - p = 4.2/6 = 0.7$, giving $p = 0.3$ and $n = 6/0.3 = 20$. The other pairs with mean 6 have the wrong variance.

8. D. $y = 3f((x + 1)/2) + 4$

Let the image point be $(x', y') = (2x - 1, 3y + 4)$. Then $x = (x' + 1)/2$ and $y = (y' - 4)/3$. Substituting into $y = f(x)$: $(y' - 4)/3 = f((x' + 1)/2)$, so $y' = 3f((x' + 1)/2) + 4$.

9. C. 10.5

The ordinates are $2^0 = 1$, $2^1 = 2$, $2^2 = 4$ and $2^3 = 8$. Trapezium rule: $(1/2)(1 + 2 \times 2 + 2 \times 4 + 8) = (1/2)(21) = 1$
0.5. The exact value is $7/\log_e(2) \approx 10.1$, so the trapezium rule overestimates for this convex curve.

10. A. 1/4

$\Pr(X < \pi/3) = \int(1/2)\sin(x)\,dx$ from 0 to $\pi/3 = (1/2)[-\cos(x)]$ from 0 to $\pi/3 = (1/2)(1 - 1/2) = 1/4$.

11. C. 2

Sketching both graphs, or solving numerically, the curves cross twice: near $x \approx -1.316$ and $x \approx 0.537$. For $x < -\sqrt{2}$ the parabola is negative while e^x is positive, and for large x the exponential is far above the parabola.

12. B. 2/3

$\log_a(b) = 3$ means $b = a^3$, so a = b^(1/3) and a^2 = b^(2/3). Therefore log_b(a^2) = 2/3.

PrepNest

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 3), 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

Get the full paper at

prepnest.com.au/practice/exams/maths_methods-year_12-3-exam2

PrepNest