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

Answers to the 12 questions in the free preview.

Section A — multiple choice

1. C. $3\pi/2$

The period of $\tan(kx)$ is $\pi/|k|$. Here $k = 2/3$, so the period is $\pi \div (2/3) = 3\pi/2$. The dilation factor -3 and the translation of 1 unit up do not affect the period.

2. A. $R \setminus \{2\}$

The graph of $y = 1/x$ has range $R \setminus \{0\}$. Translating 3 units right does not change the range; translating 2 units up shifts it to $R \setminus \{2\}$. The horizontal asymptote $y = 2$ is the excluded value.

3. E. $(3 + \sqrt{57})/2$

Combining the logarithms gives $\log_3(x^2/(x + 4)) = 1$, so $x^2 = 3(x + 4)$, giving $x^2 - 3x - 12 = 0$ and $x = (3 \pm \sqrt{57})/2$. The logarithm $\log_3(x)$ requires $x > 0$, and $(3 - \sqrt{57})/2$ is negative, so only $x = (3 + \sqrt{57})/2$ is a solution.

4. B. $k \in \{-3, 4\}$

A unique solution exists when the determinant $k(k - 1) - 12$ is non-zero. Setting it to zero gives $k^2 - k - 12 = 0$, so $k = 4$ or $k = -3$. Substituting $k = 4$ gives $x + y = 2$ and $x + y = 4/3$, which are inconsistent; $k = -3$ gives $-3x + 4y = 8$ and $-3x + 4y = 3$, also inconsistent. Both values give no solution.

5. D. 3

By the product rule, $f'(x) = \log_e(x) + x \times (1/x) = \log_e(x) + 1$. So $f'(e^2) = 2 + 1 = 3$.

6. A. 3

The average value is $(1/3)\int(4x - x^2)dx$ from 0 to 3. The antiderivative is $2x^2 - x^3/3$, which gives $18 - 9 = 9$ over the interval, and $9 \div 3 = 3$.

7. E. 0.8507

$\Pr(X \geq 2) = 1 - \Pr(X = 0) - \Pr(X = 1) = 1 - 0.0282 - 0.1211 = 0.8507$. The other options are $\Pr(X \leq 1)$, $\Pr(X = 2)$, $\Pr(X \leq 2)$ and $\Pr(X \geq 3)$.

8. C. $y = (x + 1)(x - 2)^2$

The graph crosses the x-axis at $x = -1$ and touches it at $x = 2$, so the factors are $(x + 1)$ and $(x - 2)^2$. The y-intercept is 4, and $(0 + 1)(0 - 2)^2 = 4$, which confirms the leading coefficient is 1.

9. B. $x = -1$

A local maximum of f occurs where f' changes from positive to negative. The graph of f' is above the axis for $x < -1$ and below it for $-1 < x < 3$, so the change happens at $x = -1$. At $x = 3$ the derivative changes from negative to positive, which gives a local minimum.

10. D. 0.1886

Because the event $X > 80$ lies inside the event $X > 64$, the conditional probability is $\Pr(X > 80) \div \Pr(X > 64)$. Standardising gives $\Pr(Z > 1) = 0.1587$ and $\Pr(Z > -1) = 0.8413$, and $0.1587 \div 0.8413 = 0.1886$.

11. E. 0.098

The standard deviation of the sample proportion is the square root of $p(1 - p)/n$. Here $p(1 - p)/n = 0.4 \times 0.6 \div 25 = 0.0096$, and the square root of 0.0096 is 0.098.

12. A. $f^{-1}(x) = 2 + \sqrt{(x - 3)}$

Swapping x and y gives $x = (y - 2)^2 + 3$, so $y = 2 \pm \sqrt{(x - 3)}$. The domain of f is $[2, \infty)$, which is the range of f^{-1}, so the positive square root is taken: $f^{-1}(x) = 2 + \sqrt{(x - 3)}$.

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 1), 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_12-1-exam2

PrepNest