Candidates' Performance

Module 2 (Algebra and Calculus)

In this year, 4 675 candidates sat the examination. The mean score was 52 marks. Candidates generally performed better in Section A than in Section B.

Section A

Question Number	Performance in General
1 (a)	Very good. About 95% of the candidates were able to expand $(1-x)^4$.
(b)	Very good. Over 85% of the candidates were able to expand $(1+kx)^9$, hence they were able to find the constant k .
2	Good. Many candidates were able to write $f'(2)$ as $\lim_{h\to 0}\frac{f(2+h)-f(2)}{h}$. However, some candidates were unable to multiply both the numerator and the denominator by a suitable radical.
3 (a) (i)	Very good. Over 80% of the candidates were able to complete the proof.
(ii)	Good. Many candidates were able to use the result of (a)(i) to complete this part.
(b)	Fair. Many candidates were unable to substitute a suitable value of x in the result of (a)(ii) to complete the proof.
4 (a)	Very good. Most candidates were able to use $\sin^2\theta=\frac{1-\cos 2\theta}{2}$ to find the indefinite integral.
(b)	Good. Many candidates were able to use a suitable definite integral to find the volume of the solid of revolution.
5 (a)	Very good. Most candidates were able to use mathematical induction to complete the proof.
(b)	Very good. About 75% of the candidates were able to find the required sum.
6 (a)	Fair. Many candidates were unable to express the area of the circle in terms of S .
(b)	Fair. Many candidates were unable to find $\frac{du}{dt}$, hence they were unable to find the required rate of change.
7 (a)	Very good. About 70% of the candidates were able to find the equation of Γ . However, a small number of candidates omitted the integration constant in the answer for indefinite integral.
(b) (i)	Good. Many candidates were able to use the given conditions to find the coordinates of P .
(ii)	Good. Many candidates were able to find the equation of the normal to Γ at P .

Question Number	Performance in General
8 (a)	Very good. Over 75% of the candidates were familiar with matrix operations, hence they were able to find a, b and c.
(b) (i)	Good. Many candidates were able to evaluate $M^{-1}RM$. However, some candidates were unable to find M^{-1} correctly.
(ii)	Poor. Most candidates were unable to use result of (b)(i) to deduce that $\alpha P+\beta R=M\begin{pmatrix}\alpha & 0\\ 0 & \beta\end{pmatrix}M^{-1}$, hence they were unable to complete the proof.

Section B

Question Number	Performance in General
9 (a)	Very good. Most candidates were able to write down the vertical asymptote and the oblique asymptote of H.
(b)	Good. Many candidates were able to find $f''(x)$.
(c)	Fair. Many candidates wrongly thought that there was a turning point of H at $x=-4$.
(d)	Fair. Some candidates were able to find the point of inflexion of H, but many of them were unable to show the steps of the test.
(e)	Fair. Some candidates were able to write down the definite integral for the required area. However, many candidates were unable to use integration by substitution to evaluate the definite integral.
10 (a)	Good. Many candidates were able to use integration by substitution to complete the proof.
(b)	Fair. Many candidates were unable to apply the compound angle formula to evaluate the definite integral.
(c) (i)	Good. Many candidates were able to express $\frac{\pi}{12}$ as either $\frac{\pi}{4}-\frac{\pi}{6}$ or $\frac{\pi}{3}-\frac{\pi}{4}$ to complete the proof.
(ii)	Poor. Most candidates were unable to observe that $\frac{d}{dx}\ln(\cot x-1)=\frac{\csc^2 x}{1-\cot x}$, hence they were unable to use integration by parts to complete the proof.

Question Number	Performance in General
11 (a) (i) (1)	Very good. About 75% of the candidates were able to complete the proof by using the condition $\Delta \neq 0$.
(2)	Good. Many candidates were able to solve (E) by using either Cramer's rule or Gaussian elimination.
(ii) (1)	Very good. Most candidates were able to prove that $k = -2$ by Gaussian elimination.
(2)	Very good. Most candidates were able to find the general solution of (E) by Gaussian elimination.
(b)	Poor. Most candidates were unable to consider the two cases $h = -3$ and $h \neq -3$, hence they were unable to complete the argument.
12 (a)	Very good. Most candidates were able to find $\overrightarrow{OP} \times \overrightarrow{OR}$.
(b)	Good. Many candidates were able to find the required area.
(c) (i)	Fair. Many candidates were unable to express $\overrightarrow{NR}$ in terms of $\overrightarrow{OR}$ and $\overrightarrow{ON}$, hence they were unable to find $\overrightarrow{NR} \cdot \overrightarrow{PQ}$.
(ii) (1)	Fair. Some candidates were able to use the condition that $\overrightarrow{NQ}$ is parallel to the $11\mathbf{i} + \mu\mathbf{j} - 10\mathbf{k}$ to set up equations, hence they were able to find λ and μ .
(2)	Poor. Only a small number of candidates were able to identify that $\theta = \angle ORN$.

General recommendations

Candidates are advised to:

1. show all working;
2. have more practice on rate of change;
3. have more practice on integration, including integration by substitution, integration by parts; and
4. write in appropriate vector notation such as the vector sign, scalar and vector multiplication signs.