Candidates' Performance

Module 2 (Algebra and Calculus)

Candidates generally performed better in Section A than in Section B.

Section A

Question Number	Performance in General
1	Good. Many candidates were able to find the derivative from first principles. However, some candidates skipped the step of showing $\lim_{h \to 0} \frac{\sin 3h}{3h} = 1$.
2	Good. Many candidates were able to set up the system of equations involving a and b but some candidates overlooked that there are two possible values for a .
3 (a)	Very good. Over 90% of the candidates were able to express $\overrightarrow{OP}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.
(b) (i)	Very good. Over 90% of the candidates were able to find the value of $\mathbf{a} \cdot \mathbf{b}$ by using the definition of scalar product.
(ii)	Fair. Many candidates were unable to find the answer by using the identity $\left\lvert \overrightarrow{OP} \right\rvert^2 = \overrightarrow{OP} \cdot \overrightarrow{OP}$ and the results of (a) and (b)(i).
4 (a)	Very good. Most candidates were able to find the indefinite integral by using integration by parts.
(b)	Very good. Most candidates were able to find the required area by using the result of (a).
5 (a) (i)	Very good. About 80% of the candidates were able to find the range of values of h by using the condition $\Delta \neq 0$.
(ii)	Very good. Most candidates were able to express z in terms of h and k by using either Cramer's rule or Gaussian elimination.
(b)	Good. About half of the candidates were able to solve (E) .
6 (a)	Very good. About 80% of the candidates were able to complete the proof by using the properties of similar figures.
(b)	Very good. Most candidates were able to find the required rate of change.
7 (a)	Very good. About 90% of the candidates were able to complete the proof by using compound angle formula.
(b) (i)	Fair. Many candidates overlooked that $\sin\left(3x - \frac{3\pi}{4}\right) = \sin 3x \cos\frac{3\pi}{4} - \cos 3x \sin\frac{3\pi}{4}$ and $\sin\left(x - \frac{\pi}{4}\right) = \sin x \cos\frac{\pi}{4} - \cos x \sin\frac{\pi}{4}$. Hence, they were unable to complete the proof.
(ii)	Good. Many candidates were able to solve the equation but some candidates did not reject those unsuitable values of x .

Question Number	Performance in General
8 (a)	Very good. About 70% of the candidates were able to find the equation of the tangent to Γ at P.
(b)	Good. Many candidates were able to find the equation of Γ. However, some candidates missed out the arbitrary constant in the answer for indefinite integral.
(c)	Fair. Only some candidates were able to find the point of inflexion.

Section B

Question Number	Performance in General
9 (a)	Very good. Most candidates were able to find the vertical asymptote of G but a few candidates were unable to write $f(x)$ as $x-9+\frac{36}{x+4}$, hence they were unable to obtain the oblique asymptote.
(b)	Very good. About 90% of the candidates were able to find $f'(x)$.
(c)	Good. Many candidates were able to find the maximum point and the minimum point of G but some candidates did not show the test.
(d)	Fair. Some candidates were able to find the required volume by evaluating the definite integral. However, many candidates were unable to write the integrand in the form of $Ax^2+Bx+C+\frac{D}{x+4}+\frac{E}{(x+4)^2}$ when evaluating the definite integral.
10 (a)	Fair. Some candidates were able to express $\overrightarrow{AE}$ and $\overrightarrow{AF}$ in terms of r but many candidates were unable to find the correct value of r.
(b) (i)	Poor. Less than 10% of the candidates were able to find $\overrightarrow{AD}\cdot\overrightarrow{DE}$ by using the result of (a).
(ii)	Poor. Most candidates were unable to finish the argument by considering $\angle CBF$ and $\angle CDF$.
(c)	Poor. Only a few candidates were able to point out that the volume of the tetrahedron $ABPQ$ is equal to $\frac{1}{6}\left\|\overrightarrow{AQ}\cdot(\overrightarrow{AB}\times\overrightarrow{AP})\right\|$.
11 (a)	Fair. Only some candidates were able to evaluate the definite integral by using a correct substitution.
(b) (i)	Very good. Most candidates were able to complete the proof.
(ii)	Good. Many candidates were able to evaluate the definite integral by using (b)(i) and the result of (a).
(c)	Poor. Most candidates mistakenly thought that the identities in (b)(i) were useful in the proof. In fact, only about 15% of the candidates were able to complete the proof by using a correct substitution.
(d)	Poor. Only a few candidates were able to use (c) to find the definite integral correctly.

Question Number	Performance in General
12 (a)	Very good. Most candidates were able to complete the proof by using mathematical induction but a few candidates wrongly wrote A^{k+1} as $A^k + A$ instead of $A^k A$.
(b) (i)	Good. Many candidates were able to evaluate $P^{-1}BP$.
(ii)	Fair. Only some candidates were able to complete the proof by using either the result of (b)(i) or mathematical induction. Many candidates were unable to write $\begin{pmatrix} 2 & 1 \\ -4 & -2 \end{pmatrix}^2 = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$ explicitly when they attempted to prove the statement by using mathematical induction.
(iii)	Poor. Most candidates were unable to find the correct expression of $\lvert A^m - B^m \rvert$ and hence they were unable to finish the argument.

General recommendations

Candidates are advised to:

1. show all working;
2. have more practice on integration; and
3. write in appropriate vector notation such as the vector sign, scalar and vector multiplication signs.