Candidates' performance

Module 2

Question Number	Performance in General
1. (a)	Excellent.
(b)	Very good. A few candidates overlooked that the x^2 term of the product expression must include the product of the two respective x terms in the two multipliers.
2. (a)	Excellent. Some candidates could not score full mark because they skipped the step of cancelling variables from both denominator and numerator.
(b)	Satisfactory. A number of candidates unnecessarily found the second derivative.
3.	Very good. A number of candidates poorly presented the answer as $y=-\ln 2x+2$.
4.	Satisfactory. The following conceptual errors were found: $\frac{d^2y}{dx^2}=\frac{1}{\frac{d^2x}{dy^2}}$; $\frac{d^2y}{dx^2}=(\frac{dy}{dx})^2$.
5. (a)	Very good. However, a few candidates used trigonometric substitution such as $x=9\sin^2\theta$ and got a clumsy calculation.
(b)	Good. A number of candidates tried to link this part with the result in (a) and got no progress. A few candidates wrongly changed the indefinite integral to definite by using the boundaries of the domain ± 3 as limits of integration.
6. (a)	Excellent.
(b)	Good. A number of candidates wrongly regarded $\int xe^{-1}dx$ as an integral requiring integration by parts.
7. (a)	Very good. When $n=1$, some candidates did not show clearly how to get $A^2=2A$. Some candidates wrongly started to prove the statement for $n=k+1$ by considering $A^{k+1}+A^{k+2}$ or 2^kA+A^{k+2} .
(b)	Fair. Some candidates wrongly pointed out that index law does not hold in matrix multiplication. Some candidates stated that $\det(A)=0$, but then they did not point out A^{-1} did not exist.
8. (a)	Fair. Some candidates treated the tetrahedron as parallelepiped. Many candidates mistook the volume as $\frac{1}{3}\left\|(\overrightarrow{OP}\times\overrightarrow{OQ})\cdot\overrightarrow{OR}\right\|$.
(b)	Poor. Some candidates tried to find the angle by considering the height of the tetrahedron in (a) but failed due to misunderstanding the relation between a tetrahedron and the corresponding parallelepiped. Some candidates started by finding the angle between the two vectors $\overrightarrow{OP}\times\overrightarrow{OQ}$ and $\overrightarrow{OR}$ but failed to proceed after obtaining the $96.8°$. Some candidates located the angle wrongly by considering the mid-point of PQ or an altitude OA on PQ .
9. (a)	Good. A few candidates wrongly wrote " t is a constant" or " t is an integer".
(b)	Poor. Many candidates did not consider the practical case and wrongly stated that the system should have infinitely many solutions.

10.	(a)	Good. A few candidates did not simplify the answer.
	(b)	Poor. Many candidates did not test for the minimum value of HK.
	(c) (i)	Very poor. Many candidates put CK=160 cm too early to establish the relation between x and θ.
	(ii)	Very poor. Most of the candidates scored no marks in this part. Many candidates wrongly used $\frac{d\theta}{dt}=-0.1$ and CK=160 cm in (ii) to compare $\frac{dy}{dt}$ and $\frac{dx}{dt}$.
11.	(a) (i)	Very good. Most candidates were competent in employing section formula.
	(ii)	Satisfactory. A few candidates did not simplify the answers.
	(iii)	Poor. Most candidates were able to get the two required equations but then followed by complicated calculations and could not show the two expressions correctly.
	(iv)	Fair. Many candidates could show $t=\frac{1}{2}$. But some candidates then showed that $AE:EC=2:1$ and $BE:ED=2:1$ and concluded that E is the centroid. They did not realize that this is only a necessary condition but not a sufficient condition for E to be the centroid. Another logical error is, some candidates started by assuming E is the centroid, then showed that C and D are the mid-points of OB and OA respectively.
	(b)	Very poor. Some candidates could use the condition $\overrightarrow{AC}\cdot\overrightarrow{OB}=0$ but some of them wrongly assumed that $t=\frac{1}{2}$. Some candidates tried to solve this part by Pythagoras Theorem but they made very complicated calculation and could not complete the work.
12.	(a) (i)	Excellent. A minority of candidates had wrong memorization of formula such as $A^{-1}=\operatorname{adj}A$, $A^{-1}=\frac{A^t}{\lvert A\rvert}$.
	(ii)	Good. Most of the candidates who could find the correct inverse matrix in (a)(i) could prove the given identity. But many of them did not show the last step clearly and just wrote down the given result $\frac{1}{1+p}\begin{pmatrix}k-p-1 & k\\ k & k\end{pmatrix}\begin{pmatrix}1 & p\\ -1 & 1\end{pmatrix}=\begin{pmatrix}-1 & k-p\\ 0 & k\end{pmatrix}$.
	(iii)	Satisfactory. Computational mistakes were often found. Some candidates did not substitute all 'p' to 'k'. Some conceptual mistakes such as $\begin{pmatrix}-1 & k-p\\ 0 & k\end{pmatrix}^n=\begin{pmatrix}(-1)^n & (k-p)^n\\ 0 & k^n\end{pmatrix}$, $(A^{-1}MA)^n=A^{-n}M^nA^n$ were found. It was also common to find candidates presenting $(-1)^n$ wrongly as -1^n in the final answer.
	(b)	Very poor. Some candidates gave a matrix as an answer for x_n. Out of only a few who knew how to find the answer, computational mistakes were often found such as $\begin{pmatrix}x_n\\ x_{n-1}\end{pmatrix}=M^{n-1}\begin{pmatrix}x_2\\ x_1\end{pmatrix}$; $\begin{pmatrix}x_n\\ x_{n-1}\end{pmatrix}=M^{n-1}\begin{pmatrix}x_1\\ x_2\end{pmatrix}$.
13.	(a)	Satisfactory. Many candidates could prove the identity employing various approaches. A mistake was found among some candidates: $2\sin^2 2\theta-2\cos 2\theta\sin^2 2\theta=2\sin^2 2\theta(1-2\cos 2\theta)$.
	(b)	Fair. Many errors were found in finding $\int_0^{n\pi}\sin^2 2x\cdot 2\cos 2x\,dx$ such as $\int_0^{n\pi}\sin^2 2x\cdot 2\cos 2x\,dx=\left[\frac{\sin^3 2x}{6}\right]_0^{n\pi}$; $\int_0^{n\pi}\cos 4x\,dx=[4\sin 4x]_0^{n\pi}$.

	(c)	Fair. Some candidates made mistakes like $\int_0^k xf(x)\,dx=x\int_0^k f(x)\,dx$.
	(d)	Poor. Only a few candidates attempted this part. Among them, Most of them forgot to check the prerequisite in applying the result in (c), i.e. $f(\pi-x)=f(x)$ and $f(2\pi-x)=f(x)$. Many candidates applied (c) wrongly as $\int_\pi^{2\pi}xf(x)\,dx=\frac{2\pi}{2}\int_\pi^{2\pi}f(x)\,dx$ or $\frac{2\pi}{2}\int_0^{2\pi}f(x)\,dx$.

General comments and recommendations

1. Candidates should read all the instructions on the cover page of Question-Answer Book carefully. They should show the essential steps during proofing or working towards a given answer.

2. Candidates should plan their time in order to answer all the questions within her/his competence.

3. Candidates should read the questions carefully and understand the questions before attempting them. For some questions requiring using the result of the previous part, candidates should find the linkage between the corresponding expressions and followed by appropriate process.

4. Candidates should know that they are expected to find numerical values, even in the intermediate steps, in the form of exact values unless otherwise stated. Marks may be deducted if the final answers were obtained by employing guessing or rounding of numerical values from the calculator.

5. In calculus, candidates should have a good grasp of basic concepts and formulas. They should
   - add the arbitrary constant to the answer of indefinite integral;
   - understand that the negative rate of change shows the decrease of the quantity with respect to time;
   - not miss 'π' in the formula of volume of revolution.

6. In vector, candidates should
   - write in appropriate notation such as the vector sign, scalar and vector multiplication signs;
   - remember the formulas for the area of parallelogram and for the volumes of parallelepiped and tetrahedron.

7. In matrix, candidates should be familiar with the properties of determinants and matrices listed in the Curriculum and Assessment Guide. They should be more careful to handle these properties if the determinant of the respective matri

8. In system of equ ates are expected to be familiar with the different conditions of solution and their related properti responding coefficient matrix or augmented matrix.