Candidates' Performance

Module 2

Section A

Question Number	Performance in General
1	Satisfactory. Most candidates knew the fundamental formula in finding derivative from first principles, but many of them did not convert the denominator of $\lim\limits_{h\to 0}\frac{e^{2h}-1}{h}$ to $2h$ so they failed to apply the rule $\lim\limits_{x\to 0}\frac{e^x-1}{x}=1$ correctly.
2	Very good. Some candidates, however, did not write the working steps in finding n and a. A few candidates could not express $C_1^n = n$ and $C_2^n = \frac{n(n-1)}{2}$ correctly.
3	Excellent. Some common mistakes included: ● Let P(n) be the proposition but treat P(1) and P(k) as function in the later working; ● Stating 'k is real" or "k is a constant'; ● In the second step, 'Assume the statement is true for all positive integers'; ● Not stating 'the statement is true for $n=1$' and/or 'the statement is also true for $n=k+1$' after finishing the first and/or second steps.
4 (a)	Excellent. Some candidates, however, either missed out the absolute value sign or arbitrary constant in the final answer.
(b)	Good. Some candidates wrongly employed the substitution and stated $\frac{1}{2}\int\frac{u+1}{u}du=\frac{1}{2}x+\frac{1}{2}\ln\|x\|+C$ as the final answer. A few candidates made careless mistakes such as $\frac{1}{2}\int\frac{u+1}{u}du=\frac{1}{2}u+\ln\|u\|+C$.
5	Good. A number of candidates did not transform the expression to $x+\frac{1}{x+1}$ when finding the minimum. Among them, some made mistakes in dealing with the quotient rule. A few candidates missed $x=0$ as one of the roots in solving $x^2+2x=0$ so they could not get the correct answer. Some common mistakes in finding asymptotes included: ● unaware that it must be an equation of a straight line; ● transforming expression to $1+\frac{x^2}{x+1}$ that could not lead to the oblique asymptote; ● confusion in naming between horizontal and vertical asymptotes.
6 (a)	Poor. Many candidates were not able to find the corresponding similar triangles. Among those who did, a number of candidates just wrote the given answer right after substituting h and a into the given formula without showing appropriate steps.
(b)	Good. A number of candidates wrongly treated $2700h$ as constant in the differentiation. Some carelessly copied the given 7π as 7 in the substitution.
7 (a)	Good. Some common mistakes included: ● making careless mistakes like $\sqrt{1^2+2^2+2^2}=\sqrt{5}$; ● mixing up the symbols of scalar and vector product; ● mixing up the formulae for area and volume.
(b)	Fair. Many candidates wrongly took either 1. the magnitude of $\overrightarrow{OC}$; or 2. distance between point C and $\overrightarrow{OA}$ as the distance between point C and plane $OADB$.
8 (a)	Good. Careless mistake was the main cause for the failure in obtaining full mark, such as assuming 0 on the right hand side of the augmented matrix and wrote $\left(\begin{array}{ccc\|c}1&1&1&0\\2&-1&5&0\end{array}\right)$.
(b)	Fair. More than half of the candidates were able to start the working by either substitution or matrix manipulation. But in either case, most of them did not separate the two cases of $\lambda=3$ and $\lambda\neq 3$.
9 (a)	Very Good. Nevertheless, some candidates did not add the arbitrary constant in the answer.
(b)	Very Good. Nevertheless, some candidates missed out the π in the formula for finding volume.
10 (a)	Satisfactory. Most candidates were able to employ sine formula to obtain one correct equation. But among them, many were not able to find another correct equation to arrive at the required result. Also, some skipped appropriate steps in the proof so that full mark could not be obtained.
(b)	Very Poor. Most candidates used $-1\le\cos\theta\le 1$ to start the working rather than considering the range of θ as implied in the question.

Section B

Question Number	Performance in General
11 (a)	Excellent. Over 90% of the candidates got full mark.
(b) (i)	Very good. Some candidates did not use $\|P\|=1$ and some did not wrote down P explicitly as answer after finding a, b and c.
(ii)	Satisfactory. Some candidates missed $\|P\|=1$ and calculate the determinant of P again in finding P^{-1} . Some candidates wrote $P^{-1}\begin{pmatrix}1&4\\2&3\end{pmatrix}P=P^{-1}P\begin{pmatrix}1&4\\2&3\end{pmatrix}=\begin{pmatrix}1&4\\2&3\end{pmatrix}$.
(iii)	Satisfactory. Some common mistakes included: ● $\begin{pmatrix}1&4\\2&3\end{pmatrix}^{12}=\left(P^{-1}\begin{pmatrix}1&4\\2&3\end{pmatrix}P\right)^{12}$; ● $\begin{pmatrix}1&4\\2&3\end{pmatrix}^{12}=\begin{pmatrix}1^{12}&4^{12}\\2^{12}&3^{12}\end{pmatrix}$; ● $\begin{pmatrix}-1&0\\0&5\end{pmatrix}^{12}=\begin{pmatrix}-1&0\\0&5^{12}\end{pmatrix}$.
12 (a)	Satisfactory. Mistakes were found in the point of division formula and the formula $\overrightarrow{AB}=\mathbf{b}-\mathbf{a}$.
(b) (i)	Fair. Although most candidates realised the reason for similarity is AAA, many did not prove $OD // CF$. They might take it for granted without noting $OD\perp AB$, the key feature implied from 'O is the circumcentre of the ΔABC'. Many candidates failed to give reasons for respective steps.
(ii)	Poor. Many candidates could neither apply $\mathbf{b}\cdot\mathbf{b}=\|\mathbf{b}\|^2$ nor understand $\|\mathbf{b}\|^2=\|\mathbf{c}\|^2$ which was implied from the property of circumcentre. A few candidates continued to prove $BF\perp AC$ after showing $AF\perp BC$. They did not realise proving $BF\perp AC$ was already sufficient to show that F is the orthocentre of ΔABC .

13	About 40% of the candidates did not get any mark in this question. Among them, many did not attempt any part.
(a) (i)	Fair. Many candidates missed the key step $-\tan\frac{\pi}{5}=\tan(-\frac{\pi}{5})$ in their proof, so they could not obtain full mark.
(ii)	Fair. Some candidates carelessly calculated $\frac{\pi}{2}-\frac{\pi}{5}=\frac{\pi}{3}$. Many did not know how to handle $\tan v=\cot\frac{\pi}{5}$. Among them, a few even gave the wrong answer as $v=\frac{5}{\pi}$.
(b) (i)	Satisfactory. Among the candidates attempting this part, a number of them left the answer as $(x+\cos\frac{2\pi}{5})^2+1-\cos^2\frac{2\pi}{5}$ without converting $1-\cos^2\frac{2\pi}{5}$ to $\sin^2\frac{2\pi}{5}$.
(ii)	Very poor. Among candidates successfully answered (b)(i), many could not employ the correct substitution $x+\cos\frac{2\pi}{5}=\sin\frac{2\pi}{5}\tan\theta$. Also, many candidates missed out $\sin\frac{2\pi}{5}$ in the denominator after the substitution and hence got the wrong answer.
(c)	Very poor. Among the candidates attempting this part, only a few could employ $\sin\frac{7\pi}{5}=-\sin\frac{2\pi}{5}$ and $\cos\frac{7\pi}{5}=-\cos\frac{2\pi}{5}$ in order to apply the result in (b)(ii).
14 (a)	Good. Some candidates wrongly employed logarithmic differentiation. A few wrongly substituted point B into $\frac{dy}{dx}=kpx^{p-1}$ and failed to obtain the given result.
(b)	About 60% of the candidates did not get any mark. Among them, many did not attempt this part.
(i)	Poor. A number of candidates simply obtained $k-t=\sqrt{3}$ from $(k-t)^2=3$ (where $(0,t)$ is the centre) without considering the negative root. A few even wrongly set $(t,0)$ to be the centre of the circle. For those employing geometric approach, some gave $\tan\frac{\pi}{6}=\frac{k}{2}$ without appropriate working.
(ii)	Poor. Many candidates failed to express the equation of the corresponding arc as $y=\frac{5\sqrt{3}}{3}-\sqrt{4-x^2}$. Quite a number of candidates misunderstood the question and tried to find the volume of revolution generated by the shaded region.

General comments and recommendations

1. Candidates should note 'All working must be clearly shown.' in the INSTRUCTIONS at the cover page of Quest Answer Book. They should show the steps in arriving at the answers, such as the solving of quadratic equa reasoning in geometric proof and simplification of complicated expression, otherwise marks may be deducted.

2. Candidates are reminded that the basic skills in compulsory part, such as similarity of figures, sine and co formulas, coordinate geometry about line and circle, area involving circle and tangent, are still essential.

3. Candidates should manage their time properly in order to answer as many questions as they can.

4. Candidates should be more familiar with the finding of asymptotes and the required presentation.

5. In calculus, candidates should note the basic formula and working, such as
   - $\lim_{x\to 0}\frac{e^x-1}{x}=1$; $\lim_{x\to 0}\frac{\sin x}{x}=1$;
   - adding arbitrary constant to the answer in indefinite integral;
   - the absolute value sign in $\int\frac{1}{x}dx=\ln|x|+C$;
   - π in the formula for finding volume of revolution.

6. Concerning definite integration, candidates should practise more in the method of substitution. The respec change of limits must be noted. Furthermore, special attention should be paid to the linkage with the earlier n when dealing with long question.

7. Candidates should be more familiar with the secant, cosecant and cotangent functions, an considering the range of angles when handling problems in trigonometry.

8. In vector, candidates should note
   - the notation of vector sign, scalar and vector multiplication;
   - the correct formula in calculating area and volume;
   - the location of angle between a line and a plane, and angle between two planes;
   - the relationship between vectors and some notable geometrical properties.

9. In matrix, candidates should note that matrix multiplication is not commutative. They should be more familiar w the manipulation of augmented matrix and the presentation of final answer.

10. Candidates should practice solving problems by using different mathematical methods so that they can improve th problem solving skills.

11. Candidates should note that they are expected to find numerical values, even in the intermediate steps, in ex values unless otherwise stated. Even the final answer was correct by employing guessing or rounding of numeri value from the calculator, marks might still be deducted.