Examiners' Report/
Principal Examiner Feedback

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Pearson Edexcel International A Level
in Core Mathematics C3 (6665A)
Paper 01

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General introduction

The paper was fair and provided a mixture of familiar questions and slightly more unusual challenging questions. Many of the candidates were well prepared and produced good answers showing confident and accurate algebraic skills. There was however a large group of candidates who were less confident and the spread of performance was larger than usual.

Question 1

The question was accessible and most candidates attempted all of it. 24.5% of candidates gained the full 7 marks, and a further 53% gained 5 or 6 marks.

Most achieved both marks for part (a), although many worked in degrees. Some candidates lost the Accuracy mark because they did not give a conclusion. Only a few gave two incorrect answers or did not mention the sign change.

In part (b), the majority of candidates rearranged the equation $f(x) = 0$ to give the required form. Some did not start with the equation equal to zero and so lost the mark.

Most candidates completed the iteration correctly in part (c). Those working in degrees usually only lost one accuracy mark. The majority were able to state alpha to 3 decimal places in part (d).

Question 2

About 33% of the candidates achieved full marks and a further 26% gained 5 or 6 of the 7 marks available.

In part (a) most used the lowest common denominator of $(3x + 4)(x - 1)$ successfully to combine the fractions. Those using less efficient methods usually made errors.

Almost everyone attempted to factorise their numerator, with about half of the candidates obtaining the correct brackets and the right signs. The most common mistake was a wrong sign. The majority did manage to cancel the $(x - 1)$ term which allowed reasonable access to part (b).

In part (b) the majority of candidates used the quotient rule, and used it successfully even if their numerator was incorrect. Some candidates used the product rule but most of these candidates did not simplify their answer to a single fraction.

A small minority of candidates misunderstood the notation and attempted to find the inverse function for part (b).

Question 3

This question was a good discriminator. 22.8% achieved the full 8 marks, 19% gained no credit at all and many gained marks in between.

Mostly in part (a) candidates gained all three marks or made no attempt at all. For those who knew what to do, the chain rule and the quotient rule were fairly equally used, and very few made sign slips or missed the required intermediate step.

After differentiating, most were able to write: $-\frac{\cos x}{\sin^2 x} = -\frac{1}{\sin x} \times \frac{\cos x}{\sin x} = -\text{cosec } x \cot x$ to complete the proof. Some tried to work backwards but provided no evidence that they had differentiated and could not complete their argument.

A fully correct solution to part (b) was achieved by many candidates. A common error however was writing cosec x cot x instead of cosec $2x$ cot $2x$. Those who made this mistake and did not write $u =$, $v =$, and quote the product rule gained no credit. Another common error was to omit the 2 when differentiating cosec $2x$, getting –cosec $2x$ cot $2x$ instead of –2 cosec $2x$ cot $2x$. Some candidates did not use the result from part (a) when differentiating cosec $2x$. By writing $\frac{1}{\sin 2x}$, mistakes were then made using the chain or quotient rules. There was evidence of lack of knowledge by some candidates of the product rule, or of recognition that it was required, e.g. writing $\frac{dy}{dx} = 3e^{3x} \times -2 \text{ cosec } 2x \cot 2x$.

Some candidates did not attempt part (c) at all, and although many got as far as putting $\frac{dy}{dx} = 0$ achieving $\cot 2x = \frac{3}{2}$ and then $k = \frac{2}{3}$ proved more difficult. Of those who did achieve $\cot 2x = \frac{3}{2}$, some then wrote $\tan 2x = \frac{3}{2}$ getting the answer $k = \frac{3}{2}$. Another error was to follow $\tan 2x = \frac{2}{3}$ by $\tan x = \frac{1}{3}$. It was also common to see $k = \frac{1}{3}$ from those candidates who had omitted the 2 in part (b).

Question 4

35.3% achieved the full 8 marks on this "context" question. Another 27% lost one or two marks, but there were 15% who gained no marks at all.

Part (a) was straightforward and most candidates were able to determine the value of the constant *A*.

In part (b) most candidates were able to substitute the given values into the equation and make $e^{+/-15k}$ the subject and then use logs to obtain a value for *k*. However, many then failed to score the final mark as they were often unable to demonstrate that *k* could be written in the form given on the question paper. There was often evidence of signs being changed in an attempt to achieve the stated result and clearly many candidates did not appreciate the relationship between $-\ln \frac{a}{b}$ and $\ln \frac{b}{a}$.

In part (c) many candidates were able to score full marks. Some solutions lost the final mark by failing to give the answer to the nearest minute. Weaker solutions were unable to proceed beyond expressing $e^{+/-15k}$ as a numerical fraction. Errors were sometimes seen miscopying previously obtained values and 15 was frequently miscopied as 5.

Question 5

All parts of this question were attempted by the majority of candidates, but part (b) discriminated well. Only 21.6% of candidates achieved a fully correct answer and about 35% of candidates gained 3 marks or fewer, finding the question challenging.

(a) Most, but not all, candidates found the value of *R* correctly. The angle alpha was usually correct but some gave it in degrees instead of radians.

(b) Many candidates achieved the first two marks for correct differentiation, but some did not appreciate that the well-known results for the calculus of trigonometry apply to radians and not to degrees. Many did not achieve the correct equation using $\frac{dx}{dy} = 2$ in the correct form. $3\cos y - 3\sin y = 2$ was often seen but candidates could rarely proceed from this result to achieve a correct answer for *y* and then for *x*. Using the answer from part (a) and hence obtaining $R\cos(y + a) = 2$ more frequently led to the correct answer.

Question 6

There was a poor response to the two sketches, about 25% of the candidates achieved one mark or zero, and only 7% achieved full marks on this question.

In (a)(i), if the graph was correct then most candidates got both coordinates correct as well. A small minority marked $\frac{a}{2}$ (without the negative sign) on the negative x-axis. The graph in (a)(ii) caused the majority of candidates some problems. If the graph was correct, it was rare to find all the coordinates correctly given with the y intercept on the negative y-axis.

In part (b) many candidates attempted both solutions. The method for $+(2x + a) - b = \frac{1}{3}x$ was very well done, usually with excellent algebra, although the rearranging let a small minority of candidates down. The common mistake for the second solution was changing the sign of $+b$ as well as $|2x + a|$ so writing $-(2x + a) - b = \frac{1}{3}x$ with or without the brackets. Some did not realise that there was a second solution.

Fortunately very few isolated the $(2x + a)$ term and squared both sides. This led to very difficult algebra but correct solutions by this method were seen.

Question 7

11.2% of candidates obtained full marks on this question and 9.8% dropped just one mark. But 19.9% scored no marks and about half the candidates scored fewer than half marks. There were some who did not attempt any of this question.

In (i)(a) candidates were led into the beginning of this question by being given the $\cos(A + B)$ identity, and were directed to use the double angle formulae, so many were easily able to achieve the result. A few misquoted the $\cos 2\theta$ formula but the $\sin 2\theta$ formula was usually quoted correctly. Some candidates tried to start with the RHS but did not make progress.

In (b) over half the candidates successfully replaced cos3θ and cos 2θ with the expression from part (a) and with the appropriate double angle formula, achieving an equation in terms of cos θ. The correct cubic equation was sometimes not achieved due to the misuse of brackets. A substantial number of those who did achieve the correct cubic equation successfully took 2 cos θ out as a common factor, factorised the quadratic and achieved $\frac{3}{4}$ and –1 as answers for cos θ. Very few candidates achieved the three correct answers for θ. The majority failed to consider cos $\theta = 0$ as a solution and some of those who did, wrote $\theta = 0$ as an answer. Rounding errors were made, giving 0.722 instead of 0.723 as the solution to $\cos\theta = \frac{3}{4}$, and this solution was sometimes given in degrees instead of radians.

(ii) This part was omitted by many but was well done by others, who correctly wrote sin $\theta = x$ and used the identities $\cos^2\theta + \sin^2\theta = 1$ and $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$ to achieve and state the required result.

Question 8

This was a challenging final question. Only 3.5% of candidates obtained the full 13 marks. 15% made no or little attempt at the question and only about 15% made any progress with the final part.

Most candidates were able to apply a correct method to find the inverse function, although some failed to give their final answer in terms of x and consequently lost the last mark. Very few responses gave the correct domain; a common error was to see this given as $x > 3$, or omitted completely.

In part (b) those candidates who had written their inverse function from part (a) in the form $\ln\dfrac{2}{(3-x)}$ were usually able to score full marks. However, where candidates had given the inverse function in (a) in the unsimplified form $-\ln\dfrac{3-x}{2}$; these candidates were frequently unable to deal with the negative sign and incorrect log work usually followed. Some candidates dealt with the –ln function by rearranging their equation to give both log terms on the same side. Those using this approach usually went on to apply log rules correctly and score full marks.

In part (c) many candidates were able to form an equation in t but often they were then unable to proceed any further. Those that multiplied through and went on to form a quadratic equation were usually able to apply the correct condition for equal roots and hence obtain the value for k.

Grade Boundaries

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