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Examiners' Report/
Principal Examiner Feedback

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GCE Core Mathematics C3 (6665)
Paper 01R

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Core Mathematics C3 (6665R)

Report on Individual Questions

Question 1

The majority of the candidates found this a very straightforward question to start off the paper. The overall standard of answers was very good. The main error seen was in the expansion of $-2(x + 4) = 2x + 8$ or $-2(x + 4) = -2x - 4$. Another error was either incorrectly factorising the denominator of the first fraction or failing to factorise at the start of the question producing over complicated expressions. Only a minority of candidates failed to attempt this at all.

Question 2

This question was very well attempted by candidates, with some graph sketching of a high standard. In almost all cases a correct shape was seen for part (a), with a few mislabels on the x axis (usually (2,0)). Occasional errors seen in part (b) included sketching f($|x|$) and f($-x$) rather than $|f(x)|$, and drawing a "minimum" rather than a cusp.

Question 3

In part (a), the vast majority produced completely correct solutions. There were very few answers in radians and most realised the requirement to give an exact value for R. The favoured method for α was by using tan from a full expansion of the addition formula. Errors were made when 7.07 being written without prior evidence of the square root of 50. Occasionally the angle was rounded to 8 degrees, or given as 81.9 degrees (from incorrect tan work).

Part (b) was generally answered very well with clear stages of working out shown. Nearly all candidates used (a) and moved to an equation involving cos ($x - \alpha$). Those candidates who did not use an exact value for R, rarely worked with a more accurate value than 7.07 (or even 7.1) leading to inaccurate answers. Most could find a second angle (which should have in the fourth quadrant) but a small number looked in error in the third or made no attempt at all. Errors were also seen by subtracting 8.1 instead of adding.

Part (c) was generally poorly answered and it was evident that many candidates did not know how to answer this question. Perhaps the slightly different way of linking the minimum and maximum values with the roots of an equation showed some lack of understanding across the specification.

Question 4

On the whole this question was well attempted.
In part (a) most candidates realised that the '3' was significant, although some stated f(x) > 3, or occasionally f(x) < 3. Many successful candidates sketched a graph. Some candidates stated f(x) $\geq$ 0 or f(x) $\geq$ 1.5 . However the majority answered f(x) $\geq$ 3 correctly. A range of appropriate notation was seen. Only a few candidates gave the range in terms of x.

In part (b), most candidates processed the functions in the correct order and realised the significance of the modulus. Occasionally the modulus was omitted, and some found values using both $x = -1$ and 1 in f(x) = 2(3 – 4x) + 3.

Candidates generally achieved the correct function in part (c), although a few left their answer in terms of y. A few mistakenly attempted $\dfrac{1}{g(x)}$, $-g(x)$ or $g'(x)$.

Part (d) was also done well. A few candidates found only one solution as a result of cancelling the x instead of factorising. There were not many numerical errors. Some candidates used as an alternative method letting g(x) = t and obtaining $3 - 4t + t^2 = 0$, which they solved for t and hence found x.

Question 5

Part (a) was generally very well done. Most candidates wrote down the differential of cos 2x as –2 sin 2x correctly with the occasional mistake of forgetting the negative sign in –2 sin 2x. The quotient method was the favoured method and generally the best attempted. Many also used the product rule correctly. Candidates are still losing too many marks by not quoting then applying the formula by showing clearly stages of working. This magnifies what may well be a slip and has been mentioned in many previous reports.

In part (b) the chain rule and product rule were the most successful methods used here although there was often a loss of a multiple of 2 or 3. The use of $\dfrac{1}{\cos}$ or another trig identity to begin with, led to much unnecessary work (which was often inaccurate). Some candidates tried to 'create' an answer in the required form following an error rather than working back to see where they had made a mistake. The double chain rule required to answer the question caused a little more difficulty with hardly any resorting to making (e.g.) u = 3x to help them along the way. Many different methods were used including: d/dx(cosx)$^{-2}$, d/dx(1 + tan^{2}x) using chain rule, d/dx(secx secx) using product rule, d/dx(tanx tanx) using product rule, d/dx (1/cos^{2}x) using quotient rule etc.

In part (c) it was pleasing to see that most candidates could differentiate to the correct form, and accurately, and even more so labelling it correctly as dx/dy. 1/3 instead of 2/3 was a common error at this stage. A significant minority proceeded to invert their dy/dx and finish at this stage. Attempts were made at applying $\sin^2(y/3) + \cos^2(y/3) = 1$ to produce an expression in just x. Those who successfully used the required method often failed to get the final A mark by not fully simplifying their answer. A significant number of candidates wrote $\sin(y/3) = x/2$ and then drew a triangle to find $\cos(y/3)$ which generally led to a fully correct, simplified fraction. It is disappointing that the some of the better candidates failed to gain full credit by not realising that a simplified answer should not still have a fraction in the denominator.

Question 6

Many candidates achieved a completely correct response to this question.
In part a) nearly all candidates used the identities correctly, but a significant number, after reaching $\dfrac{1}{2\sin x \cos x}$ then gave their answer as 2 cosec x sec x.

In part b) a variety of methods were seen, some fairly laborious, to achieve a quadratic equation in either sec$x$ or cos x. After solving this, a few candidates wrote sec$x$ as 1/sin$x$, and some omitted some solutions of the equation or gave incorrect secondary values. Solutions in degrees were rare.

Nevertheless many fully correct solutions were seen.

Question 7

Part (a) was generally very well done, although a significant number left the answer in surd form. In some cases there was no working shown.

Part (b) was also very well answered although again failure to write down the product rule and show clear stages of working meant candidates sometimes scored zero marks. The most common mistake was not multiplying by 2x when differentiating e^{x^2}.

In part (c) M1 was scored in most cases and good attempts were made at moving on to the given answer. Those that did not score any more marks moved on to ... = -3 and then factorised the LHS by x to move onto x= ... but a sizeable number of candidates struggled with this part.

In part (d) all but a very few cases M1 was scored and most went onto full marks. Main errors included having positive answers, poor rounding and obvious errors on the calculator. There did not seem to be a realisation that if the answer was radically different to -2.4 it was wrong and needed to be checked.

Part (e) was poorly done. Although most candidates were able to select an appropriate interval, many then failed to use their values correctly. Far too many answers contained substitutions into f(x) or the iteration formula. A number talked about the change in sign without calculating values.

Question 8

Most candidates seemed to have sufficient time to attempt all parts of this question.
Part a) was usually answered correctly.

Many candidates did not know how to attempt part b), frequently leaving it blank.
Part (c) is a procedure most candidates have now mastered, and was usually completely correct. After rearranging the equation there were a few errors in the log work; very few candidates used $\log_{10}$ rather than ln, but there were numerical errors.

Part (d) was generally approached correctly, although incorrect values of k sometimes led to an incorrect answer. However many failed to achieve the second mark because they did not round the answer to 3s.f. as required.

Part (e) was challenging. A minority of candidates managed to differentiate completely correctly, although there were some attempts with only a numerical factor missing. The use of the chain rule on a rather complicated function was one of the techniques shown to be lacking in a number of candidates.

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