General Certificate of Education

Mathematics 6360

MPC3 Pure Core 3

Report on the Examination

2010 examination – June series

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General

The overall impression of the examination was that it was accessible to the majority of the candidates with few very low marks being seen. The majority of candidates seemed to have managed their time well with few incomplete scripts.

Question 1

Part (a) This was well answered by the majority of candidates. Many fully correct responses were seen. Most candidates used $f(x) = 3^x - 10 + x^3$ and evaluated $f(1)$ and $f(2)$ correctly. There are still many candidates who still then write 'change of sign' therefore a root without clarification of where the root lies. Those candidates who used the alternative LHS RHS method were less successful, as they appeared to be unable to then make a correct statement, with many just putting 'change of sign' therefore a root.

Part (b)(i) This part was very well answered, the only real error being 3^x becoming $3x$ during rearrangements.

Part (b)(ii) Again this part was very well answered. Many fully correct responses were seen. The main error was with candidates who wrote answers to 3 significant figures rather than 3 decimal places.

Question 2

Part (a)(i) This part was very well answered by most candidates.

Part (a)(ii) The majority of candidates drew a modulus graph and therefore earned the method mark. Many correct responses to the number of sections were seen although some candidates appeared to try to sketch $y = |\sec \frac{1}{2}x|$. Most candidates who earned the first two marks went on to earn the final *A* mark although poor sketching did lose the *A* mark for variable heights in some cases.

Part (b) This was very well answered, with most candidates obtaining both marks. Where marks were lost it was usually through only offering the answer of $60°$. A few candidates thought $\sec = 1/\tan$ or $1/\sin$ and hence obtained no marks.

Part (c) Although many fully correct responses were seen many found this part difficult and scored few marks. Where candidates earned the first method mark many were able to go on to earn the *A* mark for $60°$ and $300°$. As many did not consider $(\cos 2x - 10) = -\frac{1}{2}$ they gained no further marks, since they only obtained two final answers. Candidates who did use $(\cos 2x - 10) = -\frac{1}{2}$ usually obtained full marks. Handling of $2x - 10 = 60$ proved difficult for some with $60/2 + 10$ being seen.

Question 3

Part (a) (i) The first part of this question was reasonably answered with many candidates obtaining both marks. Where candidates obtained 1 mark it was because many ended up with the answer $1/(5x - 2)$.

Part (a)(ii) Again this part was very well answered with candidates obtaining both marks. The majority of candidates arrived at $K\cos 2x$ but $K = -2$ was a common error.

Part (b)(i) This part was not answered very well. Many candidates lost a mark through using -0.693 instead of $\ln(\frac{1}{2})$ and $f(x) \geq 0$ was a common response.

Part (b)(ii) Most candidates were able to do this part with the correct answers often seen. The main error was the omission of brackets around $5x - 2$ obtaining $\sin 2(\ln 5x - 2)$. The expression for $\mathrm{fg}(x)$ was also often seen.

Part (b)(iii) For those candidates with a correct starting expression many went on to get full marks . Those candidates who used $\sin \ln (5x\text{-}2)^2$ often lost an accuracy mark for not rejecting one of their answers. Most candidates obtained the first method mark for making the correct initial step for their expression.

Part (b)(iv) This was usually well done but there were common errors of dividing by $\sin 2$ obtaining $y/\sin 2 = x$ or even $y/\sin = 2x$ and $y/2 = \sin x$

Question 4

Part (a) This was well answered by the majority of candidates with many obtaining full marks. Some candidates lost the final accuracy mark through premature rounding. Most candidates obtained the first B mark and the second B mark although substitution into $1/(1 + x^3)$ was seen quite often. The main error within the brackets for Simpson's rule was to have the 2 and the 4 reversed, although this was not common.

Part (b) Most candidates who realised the numerator was related to the derivative of the denominator and hence required a $\ln$ function were successful in obtaining all 4 marks. Three marks were obtained by candidates who failed to evaluate $\ln 1$ as 0. The major error was the use of an incorrect k in $k\ln(1 + x^3)$ with $k = \frac{1}{2}$ being the most common. These candidates usually obtained both method marks. Many candidates scored zero on this part as they obtained answers by attempts at integrating $\int x^2 \left(1 + x^3\right)^{-1} \mathrm{d}x$ obtaining expressions involving $x^3/3$.

Question 5

Part (a) Very well answered by the majority of candidates. Most candidates used the correct identity and were successful in answering this part of the question.

Part (b) Most candidates were successful in answering this part of the question. When answered correctly the factorisation of the resulting quadratic or use of the quadratic formula was usually well done but there were some sign errors. Many totally correct solutions were seen.

Question 6

Many candidates lost marks on this question from careless work when handling the number of e^{2x} terms involved.

Part (a) Most candidates obtained the correct coordinates although $(\ln x, 0)$ was a common error.

Part (b) This was generally well answered by those candidates able to use the quotient rule. Some errors with the numerator being reversed to $(\ln x - 1)$ meant candidates lost accuracy marks later in the question. Many candidates obtained 3 marks for reaching $\ln x - 1 = 0$ and many went on to find $x = \mathrm{e}$. However many stopped here without finding the value of y.

Part (c) Although many correct solutions were seen some candidates lost marks through leaving $\left(\mathrm{e}^{3x}\right)^2$ rather than simplifying it. There was also a large number of candidates who did not answer part (b) but started again here, used the quotient rule correctly and went on to then

answer the remainder of the question correctly. They seemed to realise that they needed the derivative to find a gradient but not for finding stationary points

Question 7

Part (a)(i) Very few candidates did not attempt this part and it was well answered with most candidates gaining at least part marks. The most common error was to get $v = 4\sin x$ rather than $\frac{1}{4}(\sin 4x)$. This still gave the possibility of earning both method marks.

Part (a)(ii) The first method mark was gained by most candidates for setting up the parts correctly. Many candidates who had trouble integrating $\cos 4x$ in part (a)(i) repeated their error here with $v = 4\cos x$ rather than $-\frac{1}{4}(\cos 4x)$ and therefore lost the A mark. Good candidates at this stage realised they could use their answer to part (a)(i) to write down the required solution but I am afraid most chose to do integration by parts twice in order to find a solution.

Part (b) This was not very well answered since the relationship to part (a)(ii) often went unnoticed. Most candidates obtained the first method mark for $\int x^2 \sin 4x \, dx$. The majority of candidates started again, some of them with some success, but for most their expressions usually were integrated to $Kx^3 \sin 4x$ and no further credit was available.

Question 8

Part (a) This was well answered by the majority of candidates with many fully correct responses. The main error with the stretch was using the y-direction with a scale factor of 2 and with the translation the vector often contained $+1$.

Part (b) This part was well answered by many candidates.

Part (c)(i) This was not very well answered by weaker candidates with many just rearranging the expression and then writing down the answer given without any convincing step being shown.

Part (c)(ii) This was answered better than part c(i) with many correct factorisations seen. The main error was with the rejection of the solution $e^{2x} = -1$.

Part (d) Some candidates obtained the correct answer and earned full marks. Most candidates made a reasonable attempt at the integrals with reasonable success and most showed enough to earn the B mark for subtraction of their areas. Incorrect limits of 6 and 0 often spoiled what would have been very good attempts.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.