AQA

A-LEVEL
MATHEMATICS

MPC3 Pure Core 3
Report on the Examination

6360
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General

Since the exam, much has been said and written about the perceived difficulty of this MPC3 paper, and indeed it was noticeable that far fewer students achieved high marks. Nevertheless, many very good scripts were seen and the vast majority of students were able to make an attempt at all questions. At the lower end, there proved to be plenty of accessible marks and the paper performed much as expected, with no more very low marks seen than in previous years.

As is always the case, grade boundaries are set to maintain standards year on year and this led to lower grade boundaries for this paper, particularly at grade A. The resulting distribution of uniform marks is very similar in nature to that seen in previous years.

Question 1

This question was answered very well with many students gaining full marks.

Some of the common errors were as follows.

(a) Some students ignored sin2*x* and simply differentiated $(4x+1)^3$.

The derivative of sin 2*x* was sometimes given as -2cos2*x*.

(b) Many students lost the accuracy mark when they expanded the brackets in the numerator and made numerical errors. Students also lost the final marks by reversing terms in the numerator.

(c) The main error in this part was to consider the derivative of ln*u* to be $\frac{1}{u}$ and so simply invert the answer to **(b).**

A number of students started part **(c)** by using rules of logs and these students were generally successful.

Question 2

This question was well answered by the majority of students.

(a) The main error here was the substitution of 3 which often gave an answer of 4 rather than 22.

(b) A common error was to write $x = \frac{ln5}{lnx}$ rather than $\ln x = \frac{ln5}{x}$.

(c) Most answers to this part were fully correct.

(d) **(i)** This was very well answered; the only error being not to write the answer to 2 decimal places.

(ii) The most common error was to subtract the answer to part **(i)** from 5 rather than 6.

Question 3

Most students managed to gain some credit and the correct four critical values were often seen. Many students attempted to solve the question using inequalities rather than equations but the final mark for $1 \le x \le 2$ was rarely seen.

A common error was to obtain $x = –1$ and 6 for the solution of $x^2 + 5x – 6 = 0$.

Question 4

(a) This part was very well answered. Students who started with the correct translation normally gained 4 marks, whereas students who started with the stretch often had the incorrect vector $\binom{5}{0}$ for their translation.

(b) Many students scored the majority of marks. Students who did not obtain full marks often only lost the final mark through being unable to simplify their final expression into the required form. Students who struggled with this part usually earned the first mark for the derivative but then failed to use the fact that $x = 2$ to find a numerical value for the gradient.

Question 5

Students were able to cope very successfully with the problem-solving aspects of this particular question.

(a) Students who started by finding the derivative usually went on to find $x = \frac{1}{2}\ln 8$, earning the first 3 marks and the majority then went on to earn full marks. Students earned no credit for this question for simply stating that $16x - e^{2x} = 0$.

(b) This part was also very well answered. The only real errors were to think that $g(x) = \frac{1}{x^2}$ and $gg(x) = x^4$.

Question 6

(a) This part was reasonably well answered with many students earning full marks. The main errors in setting up the integration by parts were $u = \ln 3x$, giving $\frac{du}{dx} = \frac{3}{x}$, and an inability to correctly integrate x^{-2}.

(b) Although many fully correct responses were seen, this part was poorly answered even by some very able students. The most common error was to rewrite $(\ln 3x)^2$ as $2\ln 3x$. Other errors seen included $\frac{du}{dx} = \frac{6}{x}$ and $\frac{dv}{dx} = x^2$ giving $v = \frac{1}{3}x^3$.

Question 7

(a) Many students lost marks here through not using the quotient rule as instructed.

Poor notation such as cos x^2 was often seen, as were terms with a missing 'x' such as $\frac{sin}{cos}$.

(b) Many fully correct attempts were seen and there were some good partial attempts. Students not earning full marks often earned the first 3 marks by correctly finding sin $x = \frac{2}{3}$, but they were then unable to find a second exact trigonometric ratio. Weaker students managed to obtain the first mark and then were unable to take out the simple common factor and so were unable to proceed further.

Question 8

Many fully correct responses were seen and in general most students scored well as they were able to set the question up correctly in terms of u only. Some students lost a mark at this stage for the omission of du. A common error was the inability to correctly re-arrange $u = 4x - 1$ with an answer of $x = \frac{u-1}{4}$ being frequently seen. Another common error was to 'simplify'

$(5 - \frac{(u+1)}{2})$ to $5 - \frac{u}{2} + \frac{1}{2}$.

Many students with earlier numerical errors still reached an expression in the correct form $au^{1/3} + bu^{4/3}$ and then integrated successfully to gain a further mark.

Question 9

Use of trigonometric identities and solving trigonometric equations remains a challenge for many students.

(a)(i) Most students did not realise that they needed to use the identity $\sec^2 x = 1 + \tan^2 x$ and the difference of two squares. The preferred attempted method was to change everything into sin$x$ or cos$x$ often with poor results due to incorrect algebraic manipulation. For example, $\sec x - \tan x = -5$ was commonly squared to become $\sec^2 x + \tan^2 x = 25$.

(a)(ii) Those students who realised that simple addition of the two equations was all that was required scored well on this part. A significant number of students again tried, with little success, to convert everything to sin x and cos x.

(b) Students successful in **(a)(ii)** often earned some marks in this part and others were still able to access some marks by using a correct method with an incorrect value for cos x. The mark scheme did not penalise students who gave the extra 'solution'.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator