A-LEVEL
Mathematics
MPC3 – Pure Core 3
Report on the Examination

6360
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General

Almost all candidates were able to attempt all the questions. Although the majority produced legible work there were a surprising number whose presentation left a lot to be desired. Candidates should recognise that credit cannot be given for illegible work. When an answer needs to be altered, it should be re-written and not just written over. There were many instances of missing brackets which often led to wrong answers.

Question 1.

(a) Generally well answered by the majority of candidates. Candidates appeared to have a sound understanding of the mid-ordinate rule and no other methods were seen. The main error was not working to the required degree of accuracy and hence the answer 2.542 was as common as the correct answer. A few candidates chose the wrong values of *x*, usually 1.5, 2.5 etc. and therefore earned no marks.

(b) Again reasonably well answered with few candidates earning no marks. The majority of candidates earned the method mark with their answer having the correct structure. The main errors were a missing negative sign or, more commonly, use of
$e^{2-x} \frac{1}{3x-2}$ rather than $e^{2-x} \frac{3}{3x-2}$.
Candidates who earned the first 3 marks usually gained full marks.

Question 2.

(a) This part was not as well answered as expected. The most common mistake was to have the vertex on the *y*-axis. There were also several cases of curves and V shapes not inverted with their vertex in the first quadrant.
Candidates with the correct diagram usually went on to obtain full marks. Candidates with an incorrect diagram usually gained some marks for the intercepts on the axes. Most knew the graph passed through (0, 3) and the only error on the *x*-axis was (-1.5 , 0) instead of (-2.5 , 0).

(b) $x = 1$ was a common response but there were several instances of candidates being unable to solve $3x = 3$ correctly. The second solution of $x = -5$ although seen, proved difficult for many candidates with $x = \frac{5}{3}$ being a common error.

(c) Candidates who gained full marks in part (b) normally scored both marks in this part, although a few candidates listed the inequalities separately and hence lost a mark.

(d) The translation $\binom{0}{4}$ was usually seen but where it was the first transformation, the following reflection in $y = 4$ was not seen with the common response being reflect in the *x*-axis. The most common error with the first and second transformation was to mention reflection in the *y*-axis. The description of reflections was generally poor.

Question 3.

(a)(i) Candidates who used $f(x) = 6\ln x - 8x + x^2 + 3$ usually obtained the correct numerical values and gave a satisfactory comment to gain the A mark. Candidates who compared RHS and LHS normally gained the method mark but then failed to explain why $5 < \alpha < 6$.

(ii) This was well answered with full marks usually earned. The main error occurred during the squaring with $x^2 = 16 + \sqrt{13 - 6\ln x}$ being the common incorrect response.

(iii) This part was very well answered with few incorrect responses seen.

(b)(i) The majority of candidates earned the first three marks. Several candidates stopped at this point with $x = 1$ and $x = 3$ being their final answer. The majority of candidates who continued often went on to earn full marks. Some candidates did lose one of the final accuracy marks with 6ln1 not being simplified.

(ii) Candidates who earned full marks in the previous part often went on to successfully answer this part. However many candidates found it beyond them and there were either pages of irrelevant work or no responses given.

Question 4.

(a) This part was poorly answered by the majority of candidates. $f(x) \geq 4$ was a common incorrect response. Candidates also lost marks due to poor or incorrect notation.

(b)(i) Candidates usually gained the mark for swapping *x* and *y* and there were many totally correct attempts seen. The major errors occurred when, taking logs, candidates split the $(5-x)$ into ln 5 and $\ln x$.

(ii) Although many candidates correctly gave the answer of $x = 4$, but there were just as many sightings of $x = 5$.

(c) More able candidates answered this well with fully correct responses. The majority of candidates earned the first mark but failed with simplifying the denominator. The main error was in handling the negative sign so that $2 - 6x + 9$ often became $2 - 6x - 9$ leading to the common incorrect solution of $\frac{2x-3}{7-6x}$.

Question 5.

(a) This part was very well answered by nearly all of the candidates.

(b) Again this part was very well answered by the majority of candidates with full marks often being earned. The main error was the omission of + c on the final line and some candidates also thought that the integral of tan x was $\sec^2 x$ rather than lnsec *x*.

(c) This part proved to be far more challenging. Many candidates could not define the required integral correctly with the omission of limits or the d*x* being the main errors. Candidates who were unsuccessful here but did have the required form of $\text{k}\int sec^2$ often earned some of the marks.

Question 6.

(a) Most candidates had the correct shape for the first mark, but errors usually occurred with the end points.

(b) Many candidates earned both marks. There were however many incorrect responses for $\frac{dy}{dx}$; the response of $\frac{dx}{dy} = \frac{1}{3}\cos y$ followed by $\frac{dy}{dx} = \frac{3}{\cos x}$ was a common error.

Question 7.

Although there were many very good complete solutions this question did differentiate between the more able and the less able candidates. The full range of marks were seen. Candidates who scored 6 out of 7, usually lost the mark through one incorrect final solution or a missing d*u*. Candidates who lost 2 marks usually arrived at the substitution of limits but failed to manipulate the terms in $\sqrt{2}$ and $\sqrt{5}$ into the required form.

Virtually all of the candidates scored 1 mark for $\frac{du}{dx}$ = $-2x$, but actually writing the integral in terms of *u* only caused problems for many candidates, with a common mistake of the factor $-\frac{1}{2}$ often becoming -2.

Candidates who reached this stage of their solution had varying degrees of success with the next few marks. Substitution of limits also caught out a significant number of candidates who assumed, incorrectly, that the larger value of 5 should be the upper limit.

Question 8.

(a) Although many fully correct solutions were seen, many other candidates found this question difficult.
Most candidates obtained the first 2 marks from writing the expression in terms of a single trigonometric function and equating it to *k*. Many candidates got no further and many multiple attempts using different starting points were seen. Candidates who did manage to progress gained an extra mark from a correct inversion but they often failed to isolate the trigonometric function without making some arithmetical error on the way. Candidates who did earn the first 4 marks often had difficulty with manipulating the fraction involving *k* to the required form.

Although many correct responses were seen, many candidates failed to score since they started with $\sec^2 \emptyset = 5$. A significant number of candidates who did start correctly with $\sec^2 \emptyset = 4$ then proceeded to only find the positive square root and were therefore unable to score the method mark.
The final error made by many candidates was to ignore $\emptyset = 420$ and although this still enabled candidates to gain the accuracy mark they lost one of the final B marks through only listing 3 values for x.

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