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General Certificate of Education (A-level)
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Mathematics **MFP2**

(Specification 6360)

Further Pure 2

Report on the Examination

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General

Although this paper was accessible to most candidates, there were some candidates who had clearly not studied every topic in the specification, and this limited their output. On the other hand, there were some splendid scripts showing a considerable depth of knowledge. One other general point that needs to be made is that candidates should familiarise themselves fully with the formulae booklet that they have on hand for the examinations.

Question 1

Part (a) was well done and almost universally correct. However part (b) proved to be beyond some of the most able candidates. Candidates were just not able to identify the correct position of P, the commonest positions being either at the origin or at the end of the diameter of the circle parallel to the x-axis. Even when the point P was correctly identified, not all were able to use simple geometrical properties to find the length of OP.

Question 2

The algebra of part (a) of this question was well done, and many candidates were successful with part (b). In part (b), however, in spite of the question stating 'Hence', some candidates chose to use alternative methods, usually using $\sum r$ and $\sum r^2$ from the formulae booklet; no credit was given for such attempts.

Question 3

Again part (a) was well done. Many candidates scored well in part (b) too, obtaining the results to parts (i) and (ii) in a variety of ways, although sign errors, especially in the product of the roots, did lead to a loss of marks. One common error was to think that, because $1 + \mathrm{i}$ was a root, $1 - \mathrm{i}$ also had to be a root, in spite of the fact that the coefficients of the cubic were complex.

Question 4

There were many good responses to this question. Failure, when it arose, was in the use of methods which did not use the exponential forms for $\sinh x$ and $\cosh x$. Such methods usually involved the squaring of the expression for $\frac{\mathrm{d}y}{\mathrm{d}x}$, more often than not incorrectly. When the squaring was done correctly, there was almost invariably no check that the values obtained were in fact solutions for $\frac{\mathrm{d}y}{\mathrm{d}x} = 0$, an essential step as squaring had taken place. Part (b) was often correctly worked and with adequate reasoning.

Question 5

The differentiation in part (a) was well done, apart from the occasional sign error. In part (b), whilst most candidates were familiar with integration by parts, many candidates stalled at the second integral, even though the hint had been clearly given in part (a). Even when candidates knew how to finish the question, errors of sign spoilt what would otherwise have been a good solution.

Question 6

Part (a) was extremely badly done, with few candidates scoring more than one out of the four available marks. The reason for this was that candidates failed to realise that the derivative of $\ln(\sec t + \tan t)$ is given in the formulae booklet, and so, in attempting to do the differentiation themselves, they became bogged down with the manipulation of trigonometrical functions. Part (b) was better attempted and there were many correct solutions, but, if a solution did peter out, it was generally at the stage where the candidate obtained $\sin t \sec t$ but failed to realise that that was in fact $\tan t$.

Question 7

Responses to this question were very mixed. Whilst in part (a) candidates knew what to do, after writing down a correct expression for $\mathrm{f}(k+1)-\mathrm{f}(k)$ terms such as 60^{k-1} appeared quite frequently. In part (b), there was a lot of muddled logic, with many candidates thinking that the reiteration of part (a) was a sufficient argument to prove part (b). There was also clear evidence of a lack of knowledge regarding how proofs by induction should be set out.

Question 8

Parts (a) and (b) of this question were well done; part (c)(i) was reasonably well done especially by the more able candidates. However, the Argand diagrams were very poorly drawn. Many candidates drew a rough circle by hand, with no indication of its radius, and then went on to put crosses on their circle at points which bore little resemblance to the angles in question. Some candidates drew no circle at all but drew lines of differing lengths from the origin. There were few correct responses to part (d) as candidates failed to realise the relevance of part (c), and especially part (d)(i), to this last part.

Mark Ranges and Award of Grades

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