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Mathematics MFP1

(Specification 6360)

Further Pure 1

Report on the Examination

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General

There was a good response to this paper, most candidates appearing to find the questions familiar and coping well with the demands made on them.

The parts which caused the greatest difficulty were questions 5(b), 7(b)(ii), 8(b) and 9(a)(iii). The improvement seen in the solving of trigonometrical equations over the last few papers was happily maintained, and it is now quite rare to see a candidate lamely tacking a term '$+2n\pi$' on to the end of the solution.

The examiners try to bear in mind that some candidates may not have had much time to become thoroughly familiar with the details of how best to present a piece of mathematical reasoning. On the other hand, it was possible to lose a mark through insufficient attention to detail, for example in question 2(c) where an 'equation' had to have an 'equals' sign, and in question 4(a) where many candidates failed to express a and b in the manner required by the wording of the question.

Question 1

This opening question was very well answered in the majority of cases. Many candidates showed their working in table form, but others provided slightly more detail of the methods used, which worked to their advantage if they made numerical errors. By far the most common way to lose a mark here was to perform three iterations rather than two, the candidates failing to pair off their x and y values correctly.

Question 2

Almost all candidates earned the first four marks with no apparent difficulty. In part (c), there were small errors especially in finding the product of the roots of the required equation. In the forming of the equation itself, most candidates were aware of the need to reverse the sign of the sum of the roots to give the coefficient of x. Integer coefficients were usually obtained correctly, but, as mentioned above, many candidates failed to write the necessary '$= 0$' at the end.

Question 3

Part (a) of this question was a minefield for some candidates, who showed the terms of their expansions very untidily and made errors, very often sign errors, in reaching a simplified form. In part (b), the technique of equating real and imaginary parts was well known and, in most cases, the two correct values were obtained for the imaginary part of z.

Question 4

The candidates were mostly familiar with the techniques associated with logarithms, but the relationships between a and c, and between b and m, were often left in logarithmic form rather than in the way specified in the question, which involved exponential forms. These exponentials could perhaps have pointed candidates in the right direction when they came to answering part (c), where antilogarithms were needed for both answers. The linear graphs in part (b) were mostly plotted and drawn accurately, though some candidates misused the scale on the vertical axis.

Question 5

Candidates now find trigonometrical equations a good source of marks, though many were not successful in identifying a second solution for $3x - \frac{\pi}{6}$ before proceeding to make x the subject.

There was some carelessness shown in the use of the symbol $\pm$ here.

In part (b), some candidates appeared to 'spot' the value $n = 8$, while others went to a great deal of trouble establishing that this would indeed give the minimum value required for x. Sadly, some found the value of n but failed to give the value of x.

Question 6

This was a very straightforward question for candidates who were well versed in the necessary techniques. Even when sign errors and other small slips occurred, it was usually possible to obtain high marks. Most candidates knew that in part (b)(ii) they should mention the fact that h tends to zero, though it cannot actually be equal to zero for the question to make sense.

Question 7

The first matrix calculation in this question involved a fair number of surds and minus signs, and yet it was very accurately performed by the majority of candidates. After that, it was relatively easy to reach a matrix of the required form in part (a)(ii). Almost all candidates knew how to describe the transformation represented by this matrix, but by contrast many had a long and unsuccessful struggle to describe the transformation required in part (b)(ii). An acceptable alternative here was an enlargement with scale factor –2 and a rotation through 60° clockwise.

Question 8

The asymptotes asked for in part (a)(i) were usually given correctly, and there was a high standard of curve sketching in part (a)(ii). In part (b), only a small proportion of candidates gave the full correct solution of the inequality. As well as looking at the sketch-graph, it was necessary to do a calculation here, and many candidates earned one mark out of three by finding the two correct points of intersection of the curve with the line $y = -2$.

Question 9

In part (a)(i), some candidates found the short method of using the equation $y = x$ to find the coordinates of A. More commonly, the equation of the parabola Q was used in conjunction with that of P, and after some relatively heavy algebra the required coordinates were found correctly. Most candidates were able to write down the equation of Q in part (a)(ii), or indeed had already written it down in their working for the first part of the question. Only a handful of candidates gave an adequate answer in part (a)(iii). Many stated that the common tangent had to be perpendicular to the mirror line, but for this to be entirely convincing it was necessary to mention the two points of contact of the line with the parabolas, which must be mirror images of each other.

Part (b)(i) gave candidates the opportunity to show their knowledge of quadratic theory, though in some cases they failed to keep to the rules for correct manipulation of inequalities. In part (b)(ii), some candidates immediately saw that c must be equal to –2 for the tangency case, while others virtually repeated their work done in the previous part, with equals signs, to establish the correct value of c. Once the coordinates of one point of contact had been found, it was possible to write down the other pair by using a reflection in $y = x$, but many candidates performed another calculation to find the second pair of coordinates.

Mark Ranges and Award of Grades

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