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GCE Further Pure Mathematics FP1 (6667)
Paper 1

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Introduction

Candidates found the paper accessible and standard methods were well known and accurately applied.

The standard of presentation was generally good with solutions showing logical steps making the work easy to follow. The questions that proved most challenging were question 7 and question 9.

Report on individual questions

Question 1

This question was well done by the vast majority of candidates. In part (a) virtually all successfully evaluated f(1) and f(2) and made an appropriate conclusion. There were a surprising number of cases where the conclusion was incomplete or omitted.

In part (b) again the work was often clear with many candidates using a table and making the correct conclusion. However candidates should be aware that values of the function are required e.g. in this case f(1.5) and f(1.25), to justify their conclusions. Again there were a surprising number of cases where the conclusion was omitted. Misinterpreting the requirement and applying Linear Interpolation was seen but was relatively rare.

Question 2

Part (a) was well answered with most candidates gaining the mark. There were a few instances of $(-2)^2 + (i)^2 = 4 - 1 = 3$.

In part (b) many could obtain the correct argument but many found arctan (0.5) = 0.46 or arctan (–0.5) = –0.46 and stopped. Candidates should be encouraged to consider where the point is on the Argand Diagram and use appropriate trigonometry.

Part (c) was also generally answered correctly with the most common approach being the use of the quadratic formula. Completing the square was relatively common and there were some approaches that used the sum and product of roots. Plotting the points on an Argand Diagram was usually good however there were a significant number of cases where the conjugate pair were incorrectly positioned relative to $-2 + i$.

Question 3

Many candidates gained full marks for this question. In part (a)(i) most candidates were comfortable with matrix multiplication and could correctly find $\mathbf{A}^2$. In (a)(ii), it was very common to see “Enlargement Scale Factor 3” but with no mention of the centre.

In part (b), the nature of the transformation was identified correctly although a “Rotation of 180 degrees” was common. Some tried a combination of transformations with little success.

In part (c) many knew what was meant by a matrix being **singular** and proceeded to find the correct value for k.

Question 4

In part (a) the differentiation was often successful however a significant number of candidates had difficulty dealing with the “2” in the denominator of the second term. Before differentiating, the term was often seen to be written correctly as $5(2x)^{-1}$ but this then caused problems because of the chain rule requirement.

In part (b), the Newton-Raphson process was clearly well rehearsed and many could apply it correctly. However, as with question 1, candidates should be encouraged to show all their working e.g. showing clearly their evaluation of f(0.8) and f '(0.8).

Question 5

Many candidates were able to multiply correctly and solve the resulting equations in part (a). There were some cases where the nature of the multiplication was confused, with the (4, 6) being placed before the matrix giving the incorrect equations
$-16 + 6b = 2$ and $4a - 12 = -8$.

In part (b) the property of the determinant was well known and many could correctly find the area of the quadrilateral S although some did divide by the determinant. Those unfamiliar with the property sometimes proceeded to try and transform a figure of their choice that had an area of 30 square units in an attempt to answer the question but were largely unsuccessful.

Question 6

Many candidates gained full marks in this question. It was pleasing to see that most knew what the complex conjugate was. Candidates who did struggle with this question were those who were unaware that following the substitution, there was a requirement to equate real and imaginary parts. There were some candidates who interpreted $z + 3\mathrm{i}z^*$ as $(z + 3\mathrm{i})z^*$.

Question 7

In part (a) virtually all candidates expanded correctly and substituted the standard formulae as well as identifying the "+ n". Weaker candidates then often struggled with the resulting algebra. Candidates should be encouraged to use the printed result to identify potential factors if possible, rather than multiply out completely and then start working towards the result.

Part (b) was met with less success with a large number of candidates starting again from scratch by expanding the brackets rather than using the hence.
Those who did use the result in (a) often misinterpreted what was meant by S_{3n} and this sum often ended up as $3S_n$.

Question 8

In part (a) most candidates gave the correct equation for the directrix although $x = 12$ was seen occasionally.

In part (b) all three methods for establishing the gradient were seen but with direct differentiation, after taking the square root, being the most common. Those with a correct gradient almost always proceeded to establish the correct equation for the tangent. A significant number of candidates quoted the gradient with no evidence of any calculus and these lost marks as the answer was given and this was a "show that" question.

There were a variety of approaches to part (c). The majority started with identifying the value of t and substituted this with their value of x from part (a) to correctly identify the coordinates of the point X.

Question 9

Many candidates are aware of the requirements of Proof by Induction but as in previous series, success is quite variable, and there is often a lack of precision. In part (a) the B1 mark was often scored with the relatively easy task of establishing the result for $n = 1$. Most stated the assumptive step but were then unclear what to do next and simply wrote down the result with $n = k + 1$. Those who did know they had to multiply $\begin{pmatrix} 3 & 0 \\ 6 & 1 \end{pmatrix}$ by $\begin{pmatrix} 3^k & 0 \\ 3(3^k - 1) & 1 \end{pmatrix}$ often made some progress although there was some poor use of indices. Only the better candidates could give a clear and convincing argument and then make a suitable conclusion.

Part (b) was met with less success although most could gain the first two B marks. The majority opted for the $f(k + 1) - f(k)$ approach and met with varying success. Many were not sure what to do with the resulting $7^{2k+1} - 7^{2k-1}$ expression or failed to show convincingly that it was a multiple of 12.

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