Examiners' Report/
Principal Examiner Feedback

January 2012

GCE Further Pure Mathematics FP1 (6667)
Paper 1

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Introduction

The questions on the whole were well answered with many fully correct answers. Candidates found the paper very 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.

Report on individual questions

Question 1

This question was well done by the vast majority of candidates. In part (a) virtually all successfully found the argument correctly although some candidates omitted the minus sign and gave the answer as $\frac{\pi}{4}$ rather than $-\frac{\pi}{4}$. In (b) the expansion was largely correct with very few cases of incorrect multiplication. In part (c) The majority of candidates knew the method although some candidates misread the demand as $\frac{z_1}{z_2}$.

Question 2

This question was well done by the vast majority of candidates. In part (a) virtually all successfully evaluated $f(0.5)$ and $f(1)$ 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 $f(0.75)$ and $f(0.625)$, to justify their conclusions. Again there were a surprising number of cases where the final interval was omitted. Misinterpreting the requirement and applying Linear Interpolation was seen but was relatively rare. For the Newton-Raphson approximation in (c) the work was accurate with a correct first application being correctly applied. The requirement to apply the process twice was frequently missed and candidates often stopped after the first application.

Question 3

Part (a) was well answered with most candidates gaining the mark for the focus. There were a few instances of 'directrix = x + 4' instead of giving the equation correctly. In part (b), this routine work was well executed. The differentiation was seen in all three forms with direct differentiation being the most common. Although some credit was given it must be emphasised that it is not acceptable to quote the gradient of a tangent or a normal and the full calculus method must be seen.

Question 4

In part (a) most candidates could perform the correct matrix multiplication although a surprising number simply stopped after multiplying and failed to explicitly give the coordinates as requested. In (b) the correct transformation was given in most cases although there were a few instances where candidates made some superfluous reference to the origin. In part (c), the calculation of **QR** was dealt with correctly but a significant number of candidates calculated **RQ**. Many knew how to calculate the determinant in (c) although some candidates consider det(**QR**) as being $\frac{1}{\det(\mathbf{QR})}$. In part (e) many candidates were familiar with the area scale factor property of the determinant although there were some mistakes in calculating the area of T. Some candidates tried to calculate the area of T'' directly but could gain no credit because of demand to use part (d).

Question 5

In part (a) candidates almost always identified the complex conjugate as being another root and through various methods, established the required quadratic factor and went on to find the real root. Surprisingly, some candidates stated that the real root was z – 2. There were some instances where candidates simply did not know how to find any other roots and began by substituting 3 + i into the given equation and made little progress. Candidates scored less well in part (b) as their Argand diagram gave no indication of scale for either the conjugate pair or the real root.

Question 6

In part (a) many candidates could start the induction proof correctly although it was not made explicitly clear in some cases that they had substituted n = 1 into the left hand side. Most could then set up the proof by assuming the result was true for n = k and adding the next term but the required algebra defeated some or was insufficient to be convincing. Conclusions were sometimes poorly phrased or incomplete. Candidates should be encouraged to give a full explanation once they have completed all the necessary steps and to make sure the algebra includes sufficient detail. In part (b) the algebra was more successful and candidates could show the result. For the sum in (c), many correct answers were seen although a significant number of candidates took the lower limit as 20 rather than 19.

Question 7

There were very few candidates who could not score both marks in part (a). In part (b) candidates were more successful with the induction than with 6(a) although again a significant number of candidates failed to show that the result was true for $n = 1$ and also the conclusion to the proof was sometimes lacking precision.

Question 8

In part (a) the majority of candidates knew to evaluate the determinant but there were a significant number of cases where candidates thought this was sufficient with no reference to the fact that it was not zero. Part (b) was tackled in a variety of ways. Those candidates who did not appreciate that $\mathbf{B} = \mathbf{A}^{-1}$ began by evaluating $\mathbf{A}^2$ and replaced **B** with a general matrix to produce simultaneous equations and quite often went on to find **B** correctly. Some also started the same way by evaluating $\mathbf{A}^2$ and then multiplied **A** by the inverse of $\mathbf{A}^2$ to find **B**.

Question 9

In part (a), as in 3(b), all three methods of establishing the gradient were seen and were largely very successful. Part (b) required p to be replaced by q in the result in (a) and many could score this mark irrespective of success in (a). A surprising number started again and worked out the tangent at Q with the same work as part (a). In (c), most candidates knew how to start and could obtain an equation in one variable. The subsequent algebra was met with varying degrees of success and some candidates erroneously introduced $xy = 9$ at this stage. Those candidates who went on to isolate x or y often did so successfully although many failed to give the coordinates of R in their simplest form.

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