Examiners' Report/
Principal Examiner Feedback

Summer 2013

GCE Further Pure Mathematics FP3 (6669)
Paper 01R

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Further Pure Mathematics FP3 (6669R)

Introduction

This paper proved accessible to the candidates. The questions differentiated well, with most giving rise to a good spread of marks. All questions contained marks available to the E grade candidate and there seemed to be sufficient material to challenge the A grade candidates also. The modal mark was full marks for all the questions except question 3 where, significantly, the modal mark was zero.

Generally the standard of presentation was very good.

Report on Individual Questions

Question 1

The majority of candidates (78.5%) scored full marks on this question. Most could write down the equations for the foci and the directrices and could solve simultaneously to obtain a value for a. Most then introduced the equation for the eccentricity and proceeded to obtain a value for b. A minority of candidates used the eccentricity equation for the ellipse. When using their values to obtain the equation for the hyperbola, a surprising number used the equation for the ellipse.

Question 2

The majority of candidates could obtain the direction of the common perpendicular using a vector product but there were significant number of arithmetic errors. There was less success in part (b) although for those who knew the formula this was a good source of marks. A small minority used the method that involved finding the distance of the origin from two perpendicular planes and were generally successful.

Question 3

This question caused problems in all parts. In (a) it seems the phrase 'foot of the perpendicular' was not understood and although sketches often did show an ellipse, the line PN was very often not perpendicular to $x = 8$.

The demand in (b) was also not well understood. Many candidates chose to try and find the equation of a tangent or normal to the ellipse or could make no headway in finding the locus of the midpoint. Some candidates read ahead and saw that the locus was a circle and in some cases candidates could use the information provided to determine its equation.

Question 4

Many candidates clearly knew how to tackle this question and could score the majority of marks. It was significant however that many candidates also made unnecessary errors early on when multiplying the parametric form of the line by the matrix **T**. These were both sign and arithmetic errors when multiplying the two matrices.

Question 5

For this reduction formula question, most candidates could at least make a start in part (a), choosing x^n as u and $(2x – 1)^{-½}$ as $\frac{dv}{dx}$ and making an attempt at parts. The next step of writing $(2x – 1)^{½}$ as $(2x – 1)(2x – 1)^{-½}$ evaded many and so were not able to achieve the reduction formula.
In part (b) many candidates made arithmetic slips in applying the reduction formula twice. This was probably due to the $(2n + 1)$ appearing with the I_n on the left hand side rather than just I_n. Only 36% of candidates scored full marks on this question and it proved to be a good discriminator.

Question 6

For those with a clear understanding of the nature of eigenvalues and eigenvectors, the first 6 marks in parts (a) and (b) of this question were very accessible and could be obtained with a minimal amount of work. Some candidates, as a first step, attempted the Characteristic Equation in terms of a, b and c but made no progress.

Part (b) had more of a demand as candidates had to establish the Characteristic Equation using their values of a, b and c and then solve the resulting cubic. For some this was done with relative ease whilst others struggled with the algebra.

Question 7

This question was generally well done and over half the candidates scored full marks. The method for solving the hyperbolic equation in part (a) was well known and most candidates could establish the correct values of x. The integration in part (b) was usually sound with the majority of candidates working in terms of sinh and cosh rather than exponentials and subtracting the two curves before integrating. Very few subtracted the wrong way round. A significant number of candidates performed two separate integrations and subtracted afterwards to find the area. Some candidates did struggle with the limits in order to get the final answer in the correct form.

Question 8

This question gave a large range of marks but over half of the candidates scored at least 8 marks out of the 11. Part (a) was straightforward but even so some candidates failed to show enough work to be convincing and some candidates effectively just wrote down the printed result. It is worth emphasising that ‘show that’ questions do require a complete explanation.

Many candidates made reasonable attempts at the integration by substitution although some candidates simply replaced dx with du and were able to make little progress in establishing the arc length. Not all those who managed to reach an expression involving $\cosh^2 u$ knew where to go from there and some reverted to exponentials at this point to give themselves an expression they could integrate. Those candidates who got this far, usually converted their x limits to values of u although some did revert back to x with varying degrees of success.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwant to/Pages/grade-boundaries.aspx

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