Examiners' Report

Summer 2014

Pearson Edexcel GCE in Further Pure Mathematics FP2R (6668/01R)

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General Introduction

This was a paper with some accessible and challenging questions thus every student was able to show what they had learnt.

Poor presentation can lead to a student miscopying their own work or making other errors and so achieving a lower score. It is good practice to quote formulae before substitution. When an error is made on substitution the examiner needs to be sure that the correct formula is being used before the method mark can be awarded.

If a student runs out of space in which to give their answer than they are advised to use a supplementary sheet – if extra paper is unavailable then it is crucial for the student to say whereabouts in the script the extra working is going to be done.

Report on Individual Questions

Question 1

The vast majority of students confidently separated the given function into partial fractions and demonstrated good understanding of the method of differences. Some failed to appreciate the need to divide by 2 for the required summation. Good explanation and presentation of the method was generally in evidence.

Question 2

The majority of students used a valid method to obtain the critical values in this problem (most common was to multiply through by x^2 and subtract $2x$) and it was rare to see students simply multiplying through by x. However, using the critical values to identify the regions for which the inequality held proved more challenging as some students did not appear to know how to interpret the values they had obtained. It was common to see $1 < x < 6$ and/or $2 < x < \frac{11}{3}$ as answers.

Question 3

Most students displayed a good knowledge of first order linear differential equations and the need to establish an integrating factor. Integration of e^{4x} was generally correct. The most common error in part a was the failure to multiply the constant of integration by $\cos^{2x}$ but complete solutions were seen by many.

Question 4

The majority of students knew what to do and differentiated correctly, setting their derivative to zero and proceeding to attempt to solve the equation. Some students lost marks through incorrect double angle formulae. It was fairly evenly split between those who found $\sin\theta$ and those who found $\cos\theta$ first. Some found $\cos 2\theta$ directly. The last three marks were more problematic with many students resorting to arcsin or similar (not realising that they needed to be working with exact values) and many did not give the final answer as $r = \mathrm{f}(\theta)$.

Question 5

This question was well answered and students seemed confident applying standard techniques to obtain the required Maclaurin expansion. Errors in Q05(a) tended to be seen in incorrect attempts to differentiate $\left(\frac{dy}{dx}\right)^2$ and some students lost marks because having differentiated perfectly, they then did not form an expression for $\frac{d^3y}{dx^3}$ as required by the question. Q05(b) was accessible to almost all students who were able to gain most if not all marks available.

Question 6

Few mistakes were made once the student had decided which method to use for this question although some only used the numerator of the realised expression to compare with $v = -1$ for Q06(a) or $y = 0.5$ for Q06(b). Some of the less able students tried to realise the denominator of an expression still containing w or z. Presentation was an issue with this question as it was difficult to distinguish sometimes between u and v, i and 1, 2 and z. It was very rare to see students approaching the problem using loci, which would have produced a much simpler solution than using Cartesian equations.

Question7

Q07(a) was generally attempted with confidence and good appreciation of de Moivre's Theorem. The binomial expansion was dealt with successfully and the manipulation of trigonometric functions caused few difficulties. The use of imaginary parts for the $\sin\theta$ expansion was well presented although some students failed to illustrate the specific application of de Moivre's theorem with the index of 5.

In Q07(b) most students realised the need to link the given equation in Q07(a) by the simple trigonometric substitution but the multiple solutions required proved to be a real differentiator. Only the most able students were able to provide five angles with different sine ratios.

The majority of students again recognised the need to express the given expression in terms of $\sin 5\theta$ when working on Q07(c) but issues of sign in the integration of the sine function and numerical errors in dealing with the multiple angle prevented many students from achieving the required result.

Question 8

Most students had some idea of how to approach Q08(a) although errors were seen when the differentiation went wrong to achieve $\frac{d^2y}{dx^2}$ usually by missing the $\frac{dz}{dx}$ factor. It appeared from the solutions that many students had 'differentiate' rather than 'differentiate with respect to' in their heads and therefore the chain rule was not used. Some students differentiated $\frac{dy}{dz}$ again and started with the second equation, substituting to end up with the first one. Presentation was an issue here as it was difficult to distinguish between x and z and 2 (and even y sometimes) and many students overwrote mistakes. The organisation of some students' work was poor and hard to follow which as this was a proof question made it difficult to mark.

The second part of the question was more successfully attempted with most students understanding the full method and getting the first 2 marks although some lost the 3rd by using x in their CF rather than z. There were quite a few students who used an expression of the form ax (not $ax + b$) for their particular integral and hence lost marks and others made arithmetic and sign errors in finding their constants. Although almost everyone was able to reverse the substitution for the final part, earlier mistakes cost them this final B mark.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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