

Coursework

Administration

Centres will be aware of the new computerised process for submitting marks and the generation of a sample request. This worked well for the majority of centres. However, it failed completely in cases where OCR has not been provided with a valid working email address. In these circumstances the moderator was advised of the sample chosen and requested but no work arrived because the centre had not received the request. It is crucial that OCR is provided with a valid and working email address.

Most centres adhered to the deadline set by OCR very well and if the first despatch was only the MS1 then they responded rapidly to the sample request. A small minority, however, caused problems with the process by being late with the coursework despatch. A number of centres submitted their marks so close to Christmas that a sample request could not be dealt with before the break. We would ask that all centres heed the deadlines published by the Board and organise their own processes of assessment, internal moderation and administration to enable these deadlines to be met.

The marks of most centres were appropriate and acknowledgement is made of the amount of work that is involved to mark and internally moderate. The unit specific comments are offered for the sake of centres which have had their marks adjusted for some reason.

Assessors are asked to ensure that the final mark on the cover sheet agrees with the submitted mark on the MS1 and is the sum of criteria marks.

Additionally, some assessors only give domain marks. This might be fine if the candidate deserves full marks (or zero!) for a domain, but it makes it very difficult for external moderators to understand the marking if a mark has been withheld – in this case we do not know which of the criteria have, in the opinion of the assessor, not been met adequately.

Teachers should note that all the comments offered have been made before. These reports should provide a valuable aid to the marking process and we would urge all Heads of Departments to ensure that these reports are read by all those involved in the assessment of coursework.

Core 3 – 4753/02

The marking scheme for this component is very prescriptive. However, there are a significant number of centres where so many of the points outlined below are not being penalised appropriately that the mark submitted is too generous.

The following points should typically be penalised by half a mark – failure to penalise four or more results in a mark outside tolerance.

Change of Sign

This method (and the other three as well!) should be illustrated graphically. Many candidates merely draw a graph of the function and this is accepted by assessors as an illustration. We expect to see either an annotation of the function or a number of “zoom ins” to demonstrate clearly how the iterates match the graph.

Reports on the Units taken in January 2010

Illustrations of failure often cause problems.

- The equation chosen is such that the table of values includes the value 0. In this case the root has been found and so the method has not failed.
- The equation chosen is declared to touch the axis whilst closer inspection reveals that it does not. In this case there is no root to be found.

Newton Raphson

The intention of the task in this method is that it should demonstrate the ability to find all the roots. An equation that has only one root should not be used. If a candidate does use such an equation the second mark cannot be given.

Some illustrations are not clear enough to inform the reader and therefore should not earn the mark. In particular, if the candidate is reliant on “Autograph” to illustrate the convergence by the drawing of tangents, then it is the responsibility of the candidate to use an appropriate scale to ensure that the tangents can clearly be seen – we expect to see 2 such tangents.

Failure of the method to converge to an expected root should be demonstrated “despite a starting value close to it”. By this we expect an integer value either side of the root and not a value that is artificially too far away or a contrived value that happens to be a turning value. Some candidates believe that if x_2 is further away from the root than x_1 then the process is not converging. This is not, of course, the case, and so credit in these situations should not be given.

Rearrangement

It is not expected that a candidate will simply derive $g'(x)$ and then calculate its value at x_0 or closer and claim convergence because this value fits the criterion $-1 < g'(x) < 1$. The discussion should also be based on the intersection of the curve $y = g(x)$ and the line $y = x$. Indeed, it was not one of the original intentions of this section that any differentiation should be done (and some candidates use rearrangements where $g'(x)$ cannot be calculated by them).

Comparison

For a meaningful comparison of speed of convergence to take place, the same equation should be used for all three methods, as required, the same starting point should be used and the same accuracy used. Some of these requirements were missing, yet full credit was given.

Notation

It still surprises and disappoints us (especially since it has been mentioned in reports every series so far!) that full credit is given where there is poor or incorrect notation. We see on numerous occasions an assessor writing “all correct” on the cover sheet and on the first page a statement by the candidate “I am going to solve the equation $y = \dots$ ”

Oral

The specification asks for a written report.

Differential Equations - 4758/02

There is a very small entry in the winter for this unit so any generalisations may be a little misleading.

By far the most popular task is “Aeroplane Landing”. There are three recurrent difficulties in the assessment of this task for which a scaling may be made.

The essential function of the coursework element of this module is to test the candidate's ability to follow the modelling cycle. That is, setting up a model, testing it and then modifying the assumptions to improve the original model. Most candidates can easily set up the model by making a suggestion regarding the air resistance and the reason for the rather sudden change in the pattern of values for the velocity at around $t = 9$. However, in many cases the model for the whole motion is not described by differential equations and even if it is they are not solved. In many instances the candidate will only solve the first differential equation for the first 9 seconds. The wording of the criteria clearly states that differential equations should be established and solved to model the situation which, in this case, is the whole 26 seconds. Candidates who deal only with the first 9 seconds before revising the model have not completed the task and should therefore not earn full credit.

Additionally, the development of the model assuming that air resistance is constant is not appropriate since it produces a differential equation that is too easy for this specification. The revision of the assumption that resistance is proportional to the velocity, to proportional to the square of the velocity must be justified. If it is not then there is a real danger that all the candidate will say is “the model is better because the curves are closer” and this is not following the modelling cycle but engaging in a curve fitting exercise.

Marks often seem to be automatically allocated for Domain 3 (Collection of data) when there is little discussion of the source or potential accuracy of the data.

If two or three models are suggested at the outset and tested, more or less simultaneously, and the best chosen, then the modelling cycle has not been followed.

Numerical Methods – 4776/02

There continue to be several cases where incorrect work had been ticked. Assessors are requested not to tick work unless it has been checked thoroughly.

The most popular task is to find the value of an integral numerically. In spite of the fact that these comments have been made before, assessors are giving credit where it is not appropriate and the particular criterion has not been met.

In domain 1 the basic requirement of a formal statement of the problem is often not met.

In domain 2 candidates describe what method they are to use but fail to say why.

In domain 3, a “substantial” application is to find values of M_n , T_n or S_n up to at least $n = 64$.

In domain 4 it is not enough to state what software is being used, nor is it enough to give a general printout of the formulae being used. A clear description of how the algorithm has been implemented is required, usually by presenting an annotated spreadsheet printout.

In domain 5 it is not appropriate to compare values obtained with “the real value”. This might be π . Additionally, it is accepted that candidates will use a function that they are unable to integrate

Reports on the Units taken in January 2010

(because of where they are in the course) but which is integrable. However, it is not then appropriate to state a value found by direct integration.

Many candidates, as a result of their insubstantial application, will state the value to which the ratio of differences is converging without justification from their values. This can of course lead to inaccuracy, and the failure to provide an “improved solution”. Indeed, some candidates use the “theoretical” value regardless of the values they are getting (or not if they do not work the ratio of differences) far too early giving inaccurate solutions. These are often credited, leading to some very generous marking.

In domain 6 most of the marks are dependent on satisfactory work in the error analysis domain and so often a rather generous assessment of that domain led also to a rather generous assessment here as well. Teachers should note that comments justifying the accuracy of the solution are appropriate here, but comments on the limitations of Excel are not usually creditworthy. Assessors should also note that the criteria for this task demands a solution to “at least 6 figure accuracy”. Candidates should be finding a solution to an accuracy which they can justify and that should be least 6 significant figures. For example, if their working can justify 9 significant figures then they should give that level of accuracy with justification.