Computational Mathematics/Information technology

Coursework: Deadline for submission 4:00pm on Wednesday, 21 April, 2010

This coursework consists of two parts. For the first bit you are asked to use Excel to write some functions based on splines and curves of best fit. You are required to submit your solutions on a spreadsheet using CitySpace.

You should follow the instructions for the first part carefully. Failure to, for example, submit the correct spreadsheet or define working functions as required will result in no marks for that part of the coursework.

The second part of the coursework is intended to get you to describe a piece of mathematics from the first part. The theory is standard, and there are many sources you can use to help describe it. You are required to submit this part as a Microsoft Word document. The mathematics should be written using the equation editor in Word.

The documents submitted will be checked for plagiarism using software that checks for copying from various sources, including the web and other students' work. To avoid such problems you should ensure that you write everything using you own words. Do not copy and paste. Do not copy just changing the odd word. This will be detected. Allowing others to copy your work will is treated just as severely as copying someone else's. If two or more bits of work are the same, or show significant similarities, then all the students will be in the wrong and will face potential Academic Misconduct hearings.

Part 1

For this section you should download the spreadsheet from the course web page. Make sure that macros are enabled. Fill in your personal details on the first sheet (Sheet1) before getting your question data from the second sheet (Sheet2). The data will be unique to you, and is generated from you personal data. Make sure you get this correct before you start work on the questions. There is already a module for writing Visual Basic on this sheet, and another one does not need to be created. You should rename this spreadsheet in the form Last_nameFirst_nameStudent_number.xls (so John Smith may end up with a file

`SmithJohn090001234.xls`

If you change your file format to one from Office 2007 then make sure it is one that allows you to save macros.

1. Find the linear spline through the first set of data points on "Sheet2" of your spreadsheet. Define a function `LSpline(x)` to evaluate this function.

2. Find the natural cubic spline that passes through the first set of data on your spreadsheet. Define a function `CSpline(x)` to evaluate this function.

3. Find (i) the line of best fit, (ii) the cubic of best fit and the (iii) polynomial of order 6 of best fit through the second set of data points. Define the functions `Poly1(x)`, `Poly3(x) and Poly6(x)` to evaluate each of these. Which do you think is most likely to be a good representation of the underlying function represented by the data points if some of the variation is due to error? Put your answer in the box provided on the Top sheet of the spreadsheet provided.

Part 2

Write a brief account of what a natural cubic spline is and how to calculate all the coefficients. Use you answer to question 2 in the first part to illustrate some of the calculations where appropriate. Try to aim for 3, or at the most 4 pages. More may be penalised. Use a 12 point font.

This part must be typed in a Word document, whose name has the same first part as your spreadsheet, and submitted via CitySpace.