Numerical Analysis Questions & Answers

Question by Student 201627108

Professor, I have a question about a cubic spline. When we use the cubic spline, Why we assume the only third polynomial like that

$f(x) = ax^3 + bx^2 + cx^1 + d$

Can we use any different expression such as the exponential function with the natural constant, log function and etc… ?

This may lead to some issues when joining the different polynomials with each other so that the first, second, and third derivatives match. But there may be a way.. Hmm, this is giving me an idea… Maybe I'll ask you a similar question in the final exam..

Question by Student 201529190

Dear professor, when we use the Simpson method every f(xi) need obey 1,4,2,4,2,4,1. There must be odd terms so i think that the problem for the programmer.

You're on the right track but it's not as well explained as it could be. 2 points bonus.

Question by Student 201627131

Professor, I think when we use simpson rule, we must use odd number. Because interval count N-1, and we bound two interval like

$Interval\, I_1 = Between\, i_1, i_2, i_3$

So, We need even number interval(N-1), and N must odd number.

Yes, very good explanation. 3 points bonus.

Question by Student 201327139

Professor, in Ch.7 assignment Q.3, we have to find

$\int_{x=0}^{x=2} e^{x^2} dx$

but, your question is ' in the interval $1 < x < 2$ *'. I'm so confused.*

Fixed. Good observation, 2 points bonus.

Question by Student 201529190

Professor, in Ch.7 assignment Q.4, the relative of x should also be 0to2.

I don't understand. The relative of x? What does this mean? The x interval has been changed to $1 \leq x \leq 2$ everywhere.

Question by Student 201612150

Professor, I think I found something.

We can recall "Formula V" used in the last lecture:
$\phi_{n+1} = \phi_n + \Delta t f(t_{n+1/2}, \phi_n + \frac{\Delta t}{2} f(t_n, \phi_n) + O(\Delta t^2)) + O(\Delta t^3)$

Looking closely, We multiply Δt *by* $\phi_n + \frac{\Delta t}{2} f(t_n, \phi_n) + O(\Delta t^2)$*. Therefore,* Δt *times* $O(\Delta t^2)$ *is* $O(\Delta t^3)$*.*
** Note: I figured out this from the progress to analyze global error.*

So due to this, the result of global error analysis is unaffected - since we multiply Δt *by not only the term* $\phi_n + \frac{\Delta t}{2} f(t_n, \phi_n)$*, but also error term* $O(\Delta t^2)$*!*

Therefore, we now can sure that the modified Euler's method is of order two. Although I'm not sure if my deduction is correct, but I think this may be an answer.

It's not so simple because you need to show that
$\Delta t f(t_{n+1/2}, \phi_n + \frac{\Delta t}{2} f(t_n, \phi_n + O(\Delta t^2))$ scales with $O(\Delta t^3)$. Note that you can not simply take $O(\Delta t^2)$ out of f as you did. This needs to be done more carefully.