Math 373: MI 222 HQ 1a Feb 25, 2011

Closed notes and book. NO CALCULATORS - use algebraic answers. MI 222

Submit only the problem sheets. Please do not turn in extra pages.

You may get a new sheet from the proctor if you need to start over.

If something with the question seems wrong or incomplete, make and state any assumptions needed to proceed. No questions will be answered during the exam.

1. Taylor Series

a) Derive a central *difference approximation* including the ***Order of the Error*** for the first derivative using Taylor series

b) Derive a forward *difference approximation* including the ***Order of the Error*** for the second derivative using Taylor series

c) Write the second order (three terms) Taylor Series approximation for f(x + h)

where

x = 1, h = 0.1, f(x) = 1/3 x3.

2. Deriving PDQ’s

Derive the 2D USS HC Equation in rectilinear coordinates. No generation.

3. Numerical solutions to PDQ’s

a) Write the following equation in incremental form and solve for :



1. 

4. What is the largest time step possible using the elementary numerical methods when

 = 0.3 cm2/s and x= 1 cm?



5. Worksheet Entries.

a) In a 2D SS HC problem what should the equation in Cell E14 be? Assume it represents an interior grid point.

b) Write the Excel Worksheet equation that makes the “L” term toggle 0, 1, 0, 1, etc. as the user hits the “***F9***” key in the *Iterative Calculation Mode*.

1. For a 1D USS HC worksheet solution in either Rect, Cyl, or Spherical coordinates:

If C12 is the center of the plate, cylinder or sphere, what equation is entered into that cell to make zero-flux?

6. What is the only difference in the 1D USS HC differential equations in Rect, Cyl, and Sph coordinates?

Scratch Paper – Detach and Discard – Do Not Submit.