Math 373: MI 222 HQ 1a Oct 15, 2010

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.

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

1. Taylor Series

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

b) Write the third order Taylor Series approximation for f(x + h)

where

x = 2, h = 0.1, f(x) = x3.

2. Mean Value Theorem of Derivatives

What value of  in the second derivative term satisfies the Mean Value Theorem of Derivatives for the function f(x) = x3 ?

3. Deriving PDQ’s

Derive the 1D USS HC Equation in cylindrical coordinates. No generation.

4. Numerical solutions to PDQ’s

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



1. 

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

cm2/s



6. Worksheet Entries. Write the Excel Worksheet equation

a) That makes the “L” term toggle 0, 1, 0, 1, etc.

b) Needed to make cell C12 a zero-flux, left-side boundary

c) Needed to make cell C12 a right-side, convection boundary.

Scratch Paper – Detach and Discard – Do Not Submit.