Math 373 HQ 1A Feb 25, 2014

Closed notes and book. NO CALCULATORS - use algebraic answers. CB 106

***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. a) What is the value of g for spherical coordinates?



b) What is the largest time step possible using the elementary numerical methods when solving a 2D USS heat conduction problem if  = 0.1 cm2/s and x= 3 cm?

1. Find the value of  that makes the first order approximation of f(x) = 3x3 -2x2 -3 exact for   
   f(2) based on f(1).
2. Derive a forward *difference approximation* including the Order of the Error for the second derivative (central) using Taylor series

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

b) Write the following equation in an incremental form and solve for T**´**

1. 

5. MATLAB

a) Circle three errors and state correction in the following DuFort-Frankel MATLAB code.

f= 1.5;

T=zeros(20,20);

for c=2:20

T(c,1)=0;

T(c,2)=0;

end

for r=1:E

T(r,1)=1;

T(r,20)=1;

end

for r=2:50

for c=2:20

T(r,c)= (T(r,c)+ 2\*f\*(T(r-1,c+1)+(T(r-1,c-1))-T(r-2,c)))/(1+2\*f);

end

end

mesh(T);

1. Write the formulae for interior cells E4 and E5 for a 1D USS HC worksheet solution by Saul’yev.

E4: =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

E5: =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Scratch Paper – Detach and Discard – Do Not Submit.