Finite Difference algorithm for 11/27 problem:

1. Input: m # of t points

n # of x points

T max time

gi i = 1,.. m, outside temp as a fn of t

alpha

1. Compute step sizes & constants, set up u matrix:

dt = T/(m-1)

dx = 1/(n-1)

R = alpha\*alpha\*dt/(dx^2)

u = zeros(m,n)

1. Initialize solution at t=0:

u(1,j) = 0, j = 1, ..n

1. Assign solution at x = 0:

u(i,1) = 1, i = 2, …m

1. for i = 1:m-1

for j = 2:n-1

u(i+1,j) = u(i,j) + R\*[u(i,j-1) – 2u(i,j) + u(i,j+1)]

end

u(i+1,n) = [u(i+1,n-1) + dx\*g(i+1)]/(1 + dx)

end

1. 3D Plot of solutions:

x = (0:n)\*dx; t = (0:m)\*dx

mesh(x,t,u) %(Check whether should be u or u’)

Example plot:

clear all; close all

%%3D Plots

n = 5; m = 4;

dx = 0.2; dt = 0.5;

x =(0:n)\*dx; t = (0:m)\*dt;

u = zeros(m+1,n+1);

for i = 1:m+1

for j = 1:n+1

u(i,j) = exp(-t(i))\*sin(pi\*x(j));

end

end

mesh(x,t,u)