

Student name: ***Enter your name here***

## Homework 8: 2D Heat Equation Movies

(1) Model the 2D heat equation in real time using an initial temperature distribution that is shaped like *the first letter of your first name*. The notes from lecture 11 include an example for letter M but you do not need to use such high spatial resolution.

(2) Make an animation of your letter melting away by using  $T=0$  boundary conditions. Write individual frames and then convert them into a GIF file using the ImageMagick commands “convert” or “magick” as described in lab. If you do not have the program ImageMagick installed on your computer (see online installation instructions), make your movies in 1535 Tolman Hall. [Please submit the resulting .gif file on bCourses](#). It should be less than 20 MB—please double check this before you submit.

(3) Now change from  $T=0$  boundary conditions to insulating boundary conditions. This means no heat can get out. (Get a styrofoam cup with hot coffee and think about it.) To accomplish that we need to update the values at boundary after every iteration. Instead of keeping the boundary value at 0, we set it equal to the updated value at the point next to it. In 1D, you would need to set  $T(1)=T(2)$  and  $T(N+1)=T(N)$  assuming your indices run from 1 to  $N+1$ . Please generalize this rule to 2D without worrying about the corners. Run this code with your initial letter as boundary initial condition. Please submit your Matlab code along with a picture where your initial heat distribution has partially melted away. No movie is needed this time!