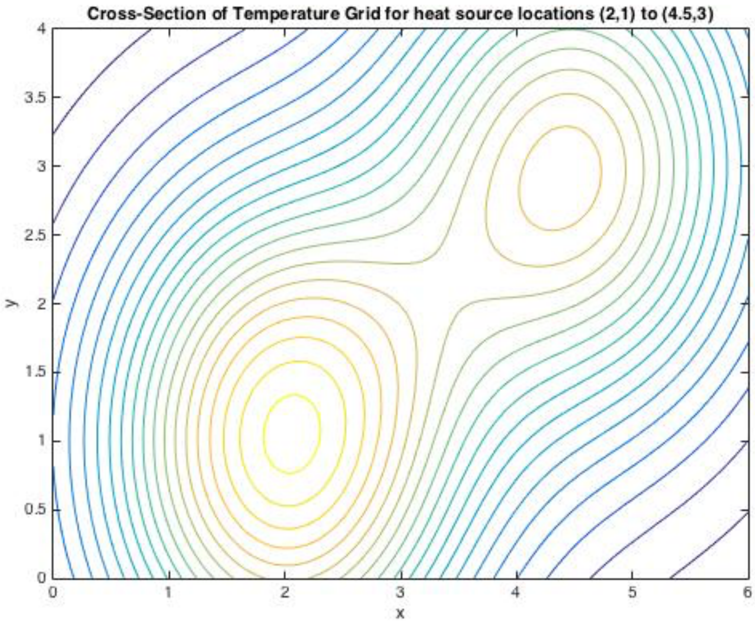
Chem/Stat3240: Homework 8a
Matlab

October 20, 2015

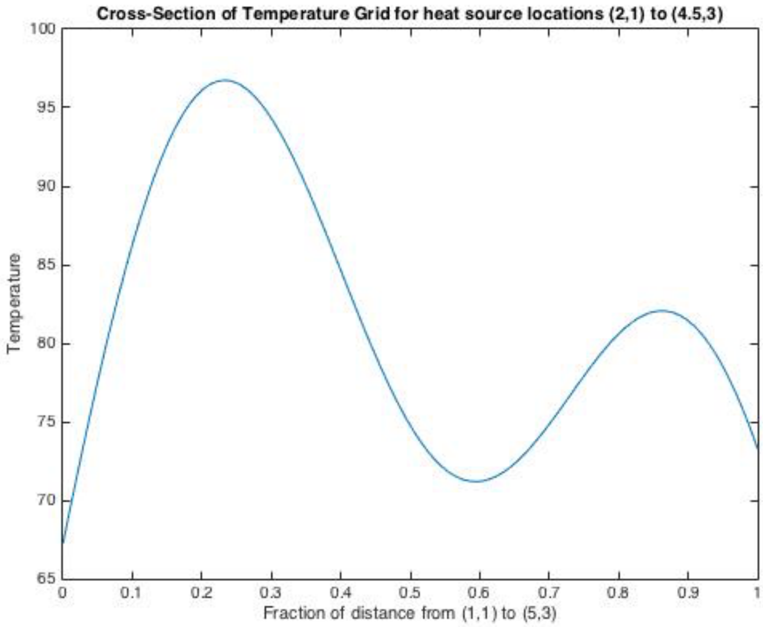
1. Download the files `Eg7_2, fOnGrid`, and `T_plate` from the Matlab Code Examples/2DArrays folder of the course Collab site.

   Modify the function `T_plate(x,y)` to create a function `T_plate1(x, y, hs)` where `hs = [x1 y1; x2 y2]` is a 2-by-2 matrix containing the (x, y) coordinates of the two heat sources on a rectangular metal plate. Make sure this function can take arrays as inputs for `x` and `y` (hint: array based processing). Now create a new function `[TVals]=plateTemp1(n,hs,plotsOn)` that takes the matrix of heat source locations as input and and computes the temperatures on an `n-by-n` grid of the metal plate. If the input `plotsOn` is 'on' , the function creates and saves the associated contour plot as the file plateTemp1.pdf, as well as outputs the matrix of temperatures calculated on the grid. In the function `plateTemp1`, use the the function `Tplate1` to create an anonymous function `T_plate2(x, y)` that just depends on `x` and `y` (given the heat sources in the list `hs` have been defined by the input to `plateTemp1`) so that `Tplate2` can be passed as input to the `fOnGrid` function to compute the temperature matrix `TVals` (See Note at end of this assignment for an example of how to do this). Use 20 contour lines between the minimum and and maximum of the matrix `TVals.` For the heat source locations given by `hs =[2 1; 4.5 3]`, you should get the following contour plot:



2. Now create a function `plateTemp2` that modifies `plateTemp1` by replaceing the call to the function `fonGrid` to compute `TVals`, using instead the function `meshgrid` to create array inputs to `T_plate2(x, y)`. Check that you get the same results as using the function `plateTemp1`.

3. Finally, create a function `[TVals]=crossSection(n,hs,endpts,plotsOn)` whose inputs are the heat source locations `hs` and a 2-by-2 matrix `endpts = [x1 y1; x2 y2]` containing the (x, y) coordinates of the endpoints of a line to be used to generate an `n-point` cross-section of the temperature distribution on the plate. The `crossSection` function will create and save a plot of the temperature distribution cross-section as the file crossSection.pdf as well as outputs the minimum and maximum temperatures of the cross-section. In addition, replace the loop in the example cross-section computation with a call to the `T_plate1` function. For the heat source locations `hs =[2 1; 4.5 3]` and endpoint locations `endpts = [1 1; 5 3]`, you should get the following plot:



Submit your files `T_plate1`, `plateTemp1`, `plateTemp2`, and `crossSection` to the Cody site, and to the collar site with three associated plots to the collab site.

Note: The following is an example of creating an anonymous function `f2` that is the same as `f1` but with just the first two inputs and the variable `z` already set.

```
f1(x,y,z)= x+y+z;
z=2;
f2:=@(x,y) f1(x,y,z);
```