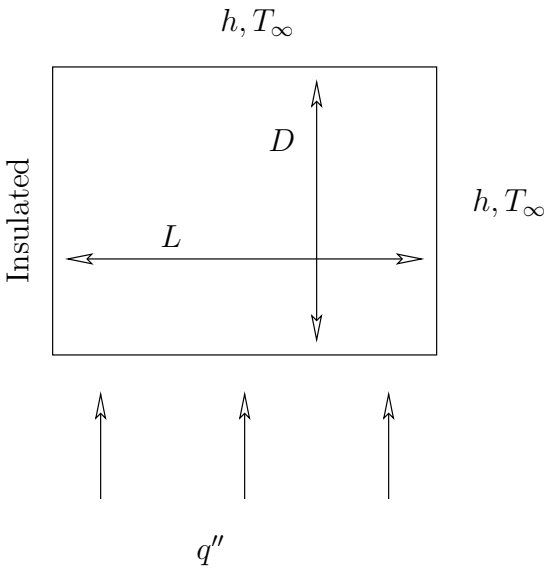
ME 603
Computing Assignment II
Due April 26, 2017

A rectangular material is heated on the bottom, exposed to a convecting fluid on the top and the right side, and insulated on the left side. The heating on the bottom may be modeled with a constant hear flux, q''. The convection may be modeled with constant h.



Treat the problem as steady, two-dimensional, with constant k, and write a matlab program to determine the steady temperature in the material. Make sure to include the following:

1. Read dimensional values of q'', h, T_∞, k, and any other variables needed from a file. The program must work properly with any reasonable values of these parameters.

2. Make all variables nondimensional and determine the solution in dimensionless variables.

3. Fill the matrix in a function (subroutine) and pass the matrix back to the main program.

4. Solve the matrix equation in a different function (subroutine) using the Gauss-Seidel method and pass the solution back to the main program.

5. Output the solution in *dimensional* variables in a different function (subroutine).

6. Find the position of maximum temperature in the material.

7. Find the position where the heat flux is maximum on the top and right boundary.

8. Present the entire temperature field graphically.

9. It *must* be possible to increase resolution in subsequent runs of the program.

Show results for the following values for the constants:

$q'' = 50{,}000\ \frac{W}{m^2}$

$k = 250\ \frac{W}{mK}$

$h = 175\ \frac{W}{m^2K}$

$T_\infty = 30\ C$

$L = 100\ cm$

$D = 50\ cm$

Honors students must also write a second program that is the same as above, except the temperature values are stored in an array matching physical space and then solution is obtained using Guass-Seidel by lines.