Exercise 1
PDE+Atomistic

Write a program to use SOR to solve the Laplace equation on an NxM rectangular grid with the following boundary conditions:

u(x,0)=0
u(x,M)=0
u(0,y)=0
u(N,y)=100

Solve to a tolerance of 10^{-8}. Make a contour plot of your final result.

You can use a weight of 1.75 for the exercise. If you have time, try using different weights. There is a formula for an approximation to the ideal weight for a rectangular region with only Dirichlet boundary conditions:

$$\left(\cos\left(\frac{\pi}{N}\right)+\cos\left(\frac{\pi}{M}\right)\right)^2\ \omega^2-16\omega+16=0$$