

Math 243A, Homework due 12/4/2012

1. Using SOR(w) solve

$$u_{xx} + u_{yy} = -2 \cos x \sin y$$

on the unit square. The boundary conditions and the exact solutions are given by $u = \cos x \sin y$. Plot the solution.

Demonstrate that convergence takes time that is linear in $N = 1/h$. Namely show that it takes $O(N)$ steps for the difference between two consecutive iterates (measured in L^2 norm as $\|e\| = (\sum_{m,l} |e_{ml}|^2 h^2)^{1/2}$) to become (say) 10^{-6} .