Lecture 24 (8.3, 8.4)

Math 170A

August 3, 2017
For solving the model problem (Poisson equation) using SOR with optimum \( \omega \), if \( h \approx \frac{1}{1000\pi} \), how many iterations would it take to reduce the error by a factor of \( e \)?

(a) \( \frac{1000}{e} \)
(b) 500
(c) 1000
(d) 500e
(e) None of these are correct.
For solving the model problem (Poisson equation) using SOR with optimum $\omega$, if we halve the mesh size, how do we affect the number of iterations till convergence?

(a) It will halve the iterations.
(b) It will not affect the iterations.
(c) It will double the iterations.
(d) It will quadruple the iterations.
(e) None of these are correct.
For solving the model problem (Poisson equation) using SOR with optimum $\omega$, find the total computational cost for solving the model problem based on $m = 1/h$, the number of grid points in each direction. (Remember: There are $m^2$ equations. Since only 5 unknowns per equation, updating an individual entry in $x$ is $O(1)$. Find the work per iteration and the total number of iterations.)

(a) $O(m)$  
(b) $O(m^2)$  
(c) $O(m^3)$  
(d) $O(m^4)$  
(e) Higher order than $m^4$. 
True/False: Exact line searches are always better than inexact line searches.

(a) True.
(b) False.