

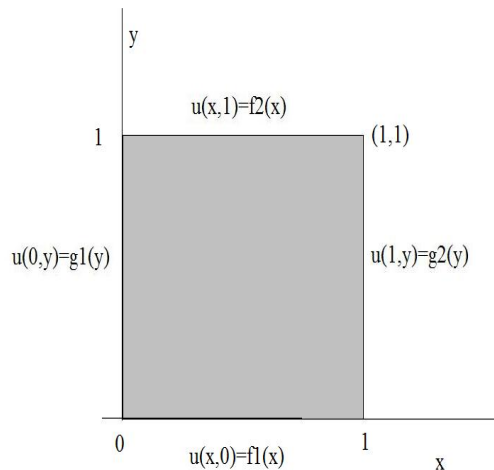
Math 519 Homework 2

Directions: NEATLY write all solutions on your own paper. Solutions should include details like integration by parts and reasons for convergence or divergence.

1) Discretize Laplace's equation $u_{xx} + u_{yy} = 0$ on the unit square for a grid defined by $0 \leq i \leq 4$ and $0 \leq j \leq 4$. Write out the system of equations and produce a matrix from them.

2) Show that a square matrix with a constant diagonal whose diagonal element is larger than the sum of the absolute values of all other entries in that row is invertible. Hint you may use Gershgorin circle theorem

3) Use 1) and 2) to solve Laplace's equation where $f_1(x) = 4x$ $g_1(y) = 4y$ and $f_2(x) = g_2(y) = 4$.



Extra credit Do the same problem for a grid defined by $0 \leq i \leq 9$ and $0 \leq j \leq 9$. What should the dimensions of the matrix be?