Machine Problem 4: due 2/8/16

1) Write a program to solve the elliptic PDE $au_{xx} + cu_{yy} = f$ on the unit disk $x^2 + y^2 \leq 1$. Use Dirichlet boundary conditions. The program should input an integer $n$, and define a grid of spacing $h = 1/(n - 1)$.

2) To test your program, let $a(x, y) = 1$, $c(x, y) = 1$, and $f = 4 + 2e^{x+y}$, in which case the true solution is $u = x^2 + y^2 + e^{x+y}$. Take the Dirichlet boundary values from the true solution. Include a computation of both the maximum error and RMS errors measured on the computational grid.

3) Run your program with $n = 11, 21, 41$ and make a table of the max and RMS errors. Submit a plot of your solution for $n = 41$. 