1) Write a program to solve the elliptic PDE $au_{xx} + cu_{yy} = f$ on the unit square $\Omega$ with the Dirichlet boundary condition. The program should use an $n \times n$ grid with $h = 1/(n - 1)$.

2) The program should include a computation of both the maximum error and RMS errors measured on the computational grid.

3) To test your program, let $a(x, y) = e^{-xy}$, $c(x, y) = x^2$, and $f = y^2 + x^4 e^{xy}$, in which case the true solution is $u = e^{xy}$. Use the true solution to define the Dirichlet boundary condition.

4) Run your program with $n = 11, 21, 41$ and make a table of the errors. Give a plot of your solution for $n = 21$.

5) Modify your program to solve the above problem, but where the Dirichlet boundary condition on $x = 0$ is replaced by a Neumann boundary condition, where $u_x = ye^{xy}$.

6) Repeat 4) for the modified program.