Problem 1

Consider the following two-dimensional diffision problem. Use the discretization below to solve for the

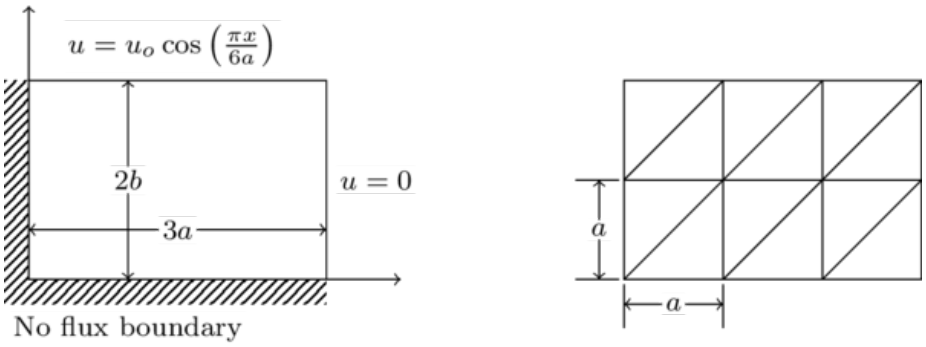

Figure 1: 2D Domain

unknown diffusing concentrations at the nodes with $a = 1$ and $u_o = 100$ assuming a consistent unit system. The diffusion coefficient matrix is the identity matrix. Perform the following three tasks:

1. Solve this problem using a direct integration of the triangular elements. (**20 points**)
2. Solve this problem by using a "parent" element mapping and Gauss integration on the rectangular elements (i.e. there are still 12 global degrees-of-freedom, just ignore the triangular elements). Use a 2×2 Gauss integration rule. (**20 points**)
3. Create effective plots to visualize your results from 1 and 2. (**5 points**)

Note: Submit a working version of your code to Canvas. Any supplemental material can be turned in to me via hard copy or scanned and submitted to Canvas with your code.