

## Problem 1

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

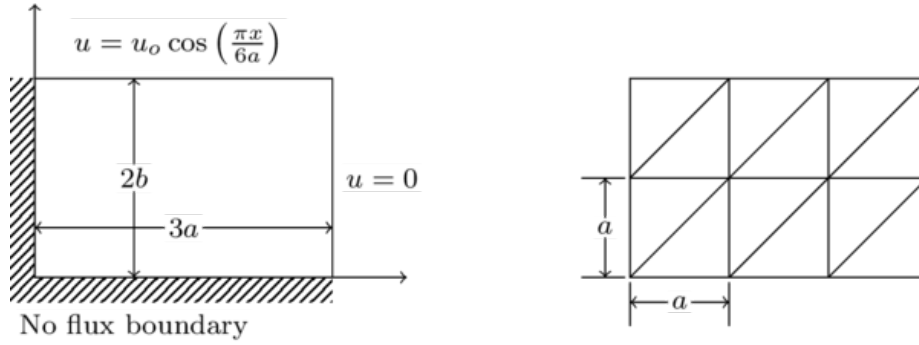


Figure 1: 2D domain

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 element (i.e. ignore the triangular elements). Use a  $2 \times 2$  Gauss integration rule. **(20 points)**
3. Create effective plots to visualize your results from 1 and 2. **(5 points)**