ME 24-731
Conduction and Radiation Heat Transfer

Assignment No: 3
Due Date: February 22, 2000
Spring 2000
Instructor: J. Murthy

1. Write the governing differential equation and boundary conditions for steady 2D constant property conduction in a square, as shown in Figure 1. Using the superposition principle, split the problem into a number of sub-problems such there is only one in-homogeneity per sub-problem. Do not solver these problems.

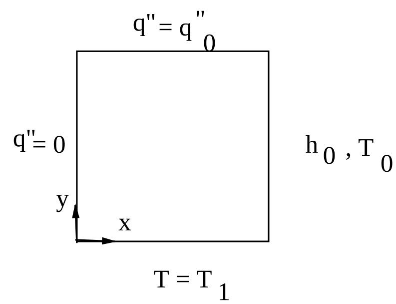

Figure 1: Domain for Problem 1

2. Consider steady 2D conduction in a square with variable thermal conductivity $k = k_0(1+\beta T)$ where k_0 and β are constants. The boundary conditions are shown in Figure 2. Using the Kirchoff transformation, find the solution for the Kirchoff variable U(x,y) in the domain. Indicate how you might find the temperature T(x,y).(You don't have to actually find it).

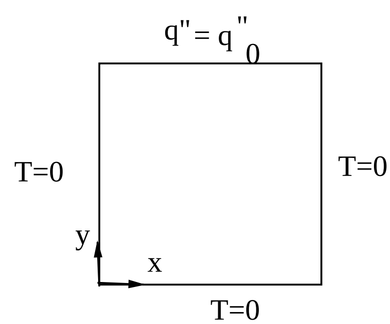

Figure 2: Domain for Problem 2

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3. Consider steady 2D constant property conduction in a 90° annular domain, with boundary conditions as shown in Figure 3. Find the temperature distribution $T(r,\theta)$.

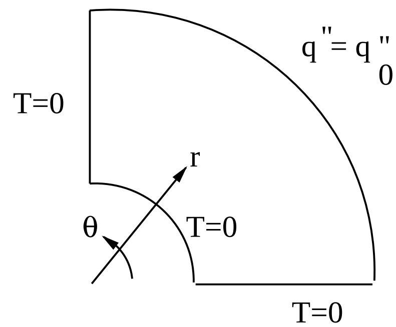

Figure 3: Domain for Problem 3