CIVL 7111 - Special Modelling Project 13

## Heat Transfer – Steady State Heat Conduction

Problem Statement - Consider the problem of the steady state heat conduction. The general two-dimensional boundary-value problem is

$$\frac{\partial}{\partial x}\left(k_x \frac{\partial T}{\partial x}\right) + \frac{\partial}{\partial y}\left(k_y \frac{\partial T}{\partial y}\right) = 0 \qquad \text{in } \Omega$$
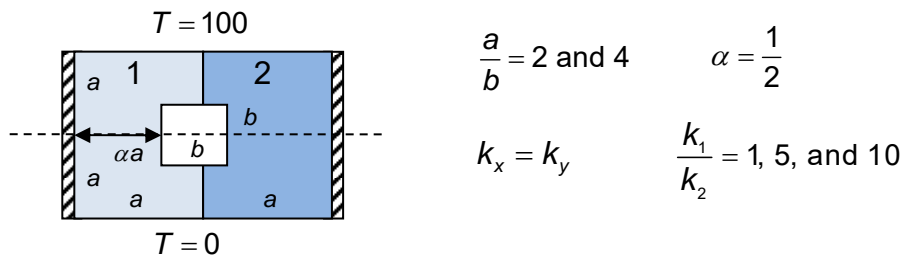
$$T = g(s) \quad \text{on } \Gamma$$

where the dependent variable T is the temperature and k_x and k_y are the thermal conductivites in the x and y directions.

Consider the a cross-section shown in the diagram below:

$$\frac{\partial}{\partial x}\left(k_x \frac{\partial T}{\partial x}\right) + \frac{\partial}{\partial y}\left(k_y \frac{\partial T}{\partial y}\right) = 0$$

$$T = g(s)$$

$$T_1 = T_2$$

Consider the a cross-section shown in the diagram below:

$$\frac{a}{b} = 2 \text{ and } 4 \qquad \alpha = \frac{1}{2}$$

$$k_x = k_y \qquad \frac{k_1}{k_2} = 1, 5, \text{ and } 10$$
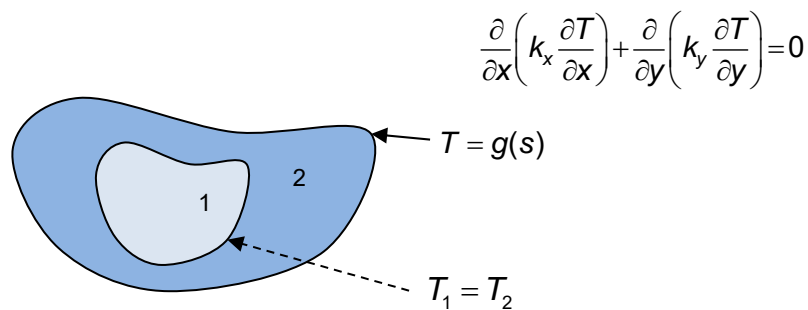
Insulated on the inside boundary and on the left and right boundaries

Use **POIS36** to the model this problem for the various cases indicated by the ratio a/b and k_1/k_2. From these results plot the temperature over the doamin.