CIVL 7111 - Special Modelling Project 12

Heat Transfer – Steady State Heat Conduction

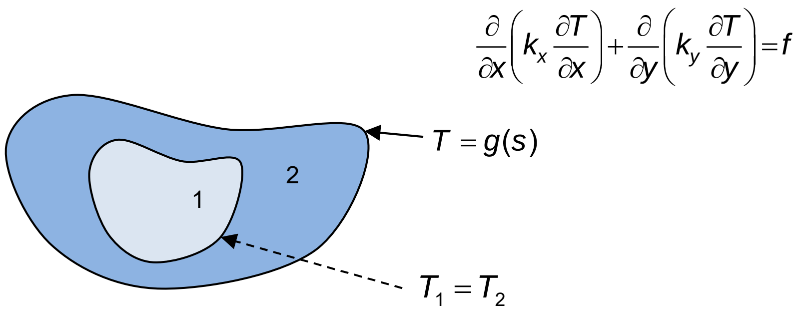
Problem Statement - Consider the problem of the steady state heat conduction. The general two-dimensional boundary-value problem is

$$\frac{\partial}{\partial x}\left(k_x \frac{\partial T}{\partial x}\right) + \frac{\partial}{\partial y}\left(k_y \frac{\partial T}{\partial y}\right) = f \qquad \text{in } \Omega$$

$$T = g(s) \qquad \text{on } \Gamma$$

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:



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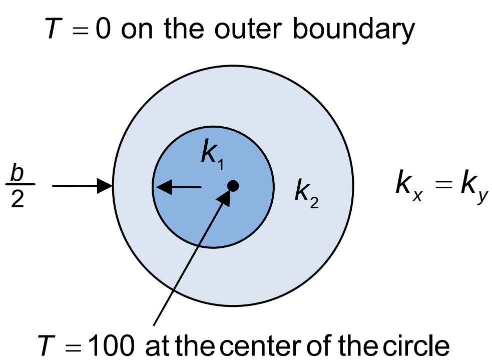

$a =$ outer diameter = 1

$b =$ inner diameter

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

$$\frac{k_1}{k_2} = 1, 5, \text{ and } 10$$

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.