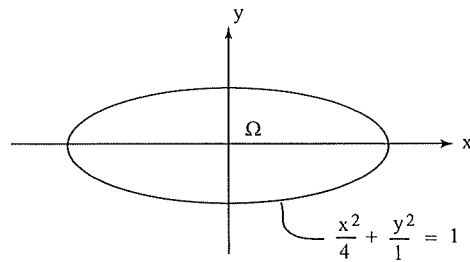


ESM 5734
Computer Project

Find an approximate solution by the FEM of the following boundary-value problem.

$$\begin{aligned} -\Delta^2 u &= 10^3 \text{ in } \Omega, \\ u &= 0 \text{ on } \partial\Omega \end{aligned}$$



The analytical solution of the problem is

$$u^a = \frac{(-2/3)(10^3)}{\left(1 - \frac{x^2}{4} - \frac{y^2}{1}\right)}$$

Refine the FE mesh till

$$\begin{aligned} \|u^a - u^n\|_0 &= 0.05 \|u^a\|_0 \\ \|u^a\|_0^2 &= \int_{\Omega} u^{a^2} d\Omega \end{aligned}$$

Find $\frac{\partial u^n}{\partial x}$ at ~~2~~ (2,0) and $\frac{\partial u^n}{\partial y}$ at (0,1).
 u^n = numerical solution by the FEM.