

Lab 3: 02/11/04
Plate with a Hole

1. Consider the steel plate depicted in figure 1. The dimensions are $400 \times 100 \times 10\text{mm}$, the hole with $\varnothing = 50\text{mm}$ is located at the center. The applied stress is $\sigma_0 = 100\text{N/mm}^2$. Modell the plate as a 2D plane stress problem in femlab.

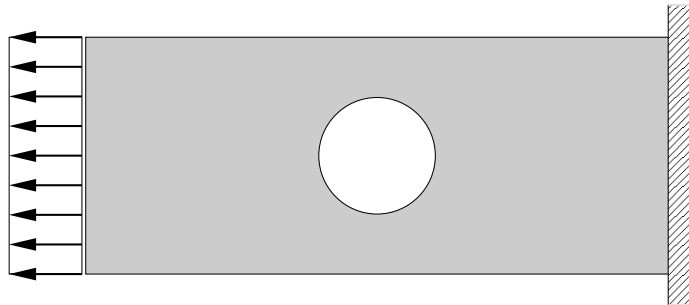


Figure 1: Plate with a hole

2. Generate a mesh with the following parameters
max edge size = 100 ,
mesh growth rate = 1.99 ,
mesh curvature factor = 0.5 ,
and make sure you understand how those parameters affect the mesh generation.
3. Solve the problem with the original mesh and three subsequently refined meshes (using the femlab refine button). Record the number of elements N and the maximum von Mises stress as a factor of σ_0 with 4 digit accuracy.
4. Do this with linear, quadratic and cubic elements. (For cubic elements only use two subsequent refinements.) Plot the stress concentration factor versus $\ln(N)$ for the three element types into one figure with proper annotations. What is the converged value of the stress concentration factor K ?
5. Make one plot of the von Mises stress imposed onto the deformed body.
6. Change the mesh parameters and try to find a mesh that gives you an accurate result for K with few elements.

Remark:

Make sure you show me your plots results from parts 4.,5. and 6. before you go home.