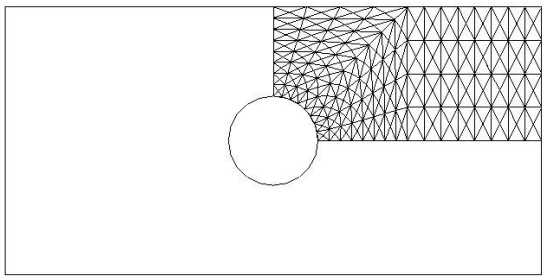
Exercise E6.1:



Consider the geometry above. Assume that plane strain condition prevails and that the material can be described by a St. Venant-Kirchhoff constitutive model, i.e. a linear relation between the second Piola-Kirchhoff stress tensor and the Green's strain tensor (note that this constitutive relation is not a very good assumption for large strains). Isotropy is assumed with the material properties E=210GPa and v=0.3. The geometry is defined by the width 600mm, height 300mm and radius 50mm describing the size of the hole.

A total Lagrangian formulation should be used in the calculations and, therefore, the following functions should be written

1) plan3ge.m: Calculating the stiffness matrix.
2) plan3gs.m: Calculating Green's strains and the deformation gradient.
3) plan3gf.m: Calculating the internal force vector.

The element is a plane three node element where the two displacements are assumed to vary linearly within the element.

a) Write the script file 'data.m' loading geom7e1.mat .Check that the geometry and boundary conditions. A displacement boundary condition should be applied at the right side and symmetry should be used as indicated in the figure.

b) Write the script file 'nrchap6.m' containing the Newton-Raphson algorithm.

c) Plot the force vs. the displacement. To plot the undeformed geometry and deformed geometries use the Calfem commands eldraw2 and eldisp2, respectively.