459.731 Theory of Poroelasticity

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Assignment #9 (10 May)

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1.
The displacement field around a circular hole under uniaxial far field stress state is given as follows (Eq.8.124, 8.125).

$$\frac{8Gu_r}{a\sigma_1^{\infty}} = \left[(\kappa-1)\left(\frac{r}{a}\right) + 2\left(\frac{a}{r}\right)\right] + 2\left[\left(\frac{r}{a}\right) + (\kappa+1)\left(\frac{a}{r}\right) - \left(\frac{a}{r}\right)^3\right]\cos 2\theta$$

$$\frac{8Gu_\theta}{a\sigma_1^{\infty}} = -2\left[\left(\frac{r}{a}\right) + (\kappa-1)\left(\frac{a}{r}\right) + \left(\frac{a}{r}\right)^3\right]\sin 2\theta$$

By superposition, obtain a displacement field under biaxial stress field.

2. Using a spreadsheet program such as excel or other programming languages, make a program that allows us to calculate the state of stresses and displacements around a circular hole in a rock mass under any arbitrary magnitude of far-field boundary stresses, internal pressure, material properties and dimensions of the holes.