TAM 524 Homework #2 Due February 25, 2015

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Consider Lecture # 5 of the notes. Redo the example problem of heterogeneity under shear for the case of a rigid inclusion (the case where). Please first check whether you get the same solution as the example problem. Consider plotting the shear strains along the equator and along the north pole of the sphere as a function of x1/a as considered in the lecture notes.

2. The lattice mismatch of cuboidal precipitates with the matrix results in an eigenstrain of the form . The cuboidal precipitate has dimensions 2a (all sides are equal). You can solve : (1) Using the Green's functions (Equations 6.1 Mura) for full space, or (2) use Equations 11.33 and 11.34 and compute the Dijkl tensor for the cube case. Numerical integration needs to be considered. Plot the strain distribution on the x1 - x2 plane. Then, plot the normalized stresses in x1 and x2 directions. Assume isotropy (poisson’s ratio of 0.3) and same moduli for matrix and precipitate. Are the shear stresses and strains zero? Is the  continuous across the interface?



3. **Bonus question:** How would you solve Problem #2 for the strains (constrained strain) in the inclusion if the material (both precipitate and matrix) were cubic (not isotropic) crystals of same moduli? The x2 habit is taken as [010].