# 1.033/1.57 H#1: Deformation & Strain

**Due: September 17, 2003**

**MIT – 1.033/1.57**
Fall 2003
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**DOUBLE SHEAR:** We consider a double shear test on a material specimen as sketched in the Figure below. The displacement field is defined by:

$$\underline{\xi} = \alpha\,(X_2\underline{e}_1 + X_1\underline{e}_2)\,; \quad \alpha \geq 0$$

Determine

1. **In Finite Deformation:**
   (a) The deformation gradient;
   (b) The change in volume of the material specimen;
   (c) The change in surface area and orientation of any surface oriented by $N = 1/\sqrt{2}\,(e_1 + e_2)$. How does the result compare to the simple shear scenario (see lecture Notes #1.6)
   (d) The Green-Lagrange Strain Tensor, its Eigenvalues and Egenvectors (i.e. principal strains and principal strain directions)
   (e) The linear dilatations and distortions.
2. **In Infinitesimal Deformation**:
   (a) How does the assumption of infinitesimal deformation read in double shear?
   (b) How do the elements determined in Part 1 change in the infinitesimal deformation tehory?

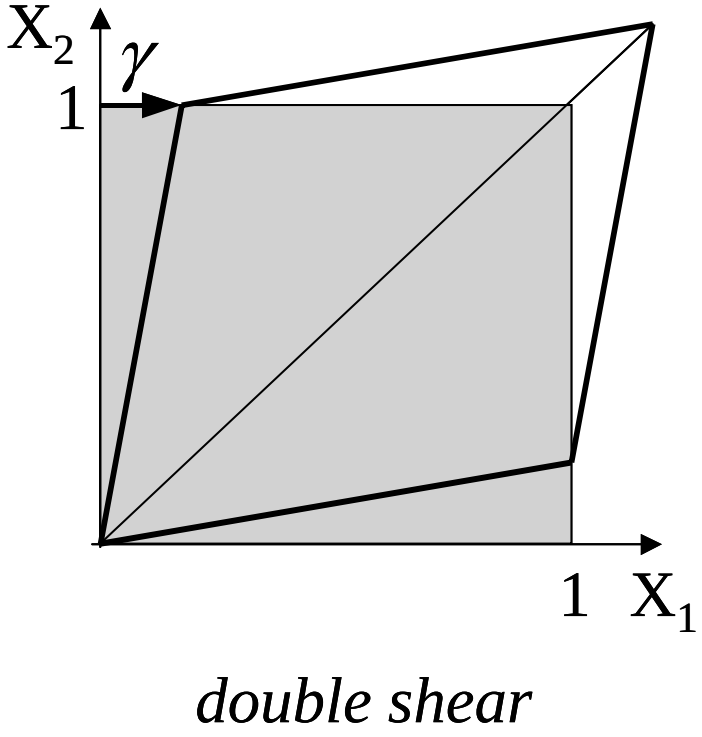


Figure 1: