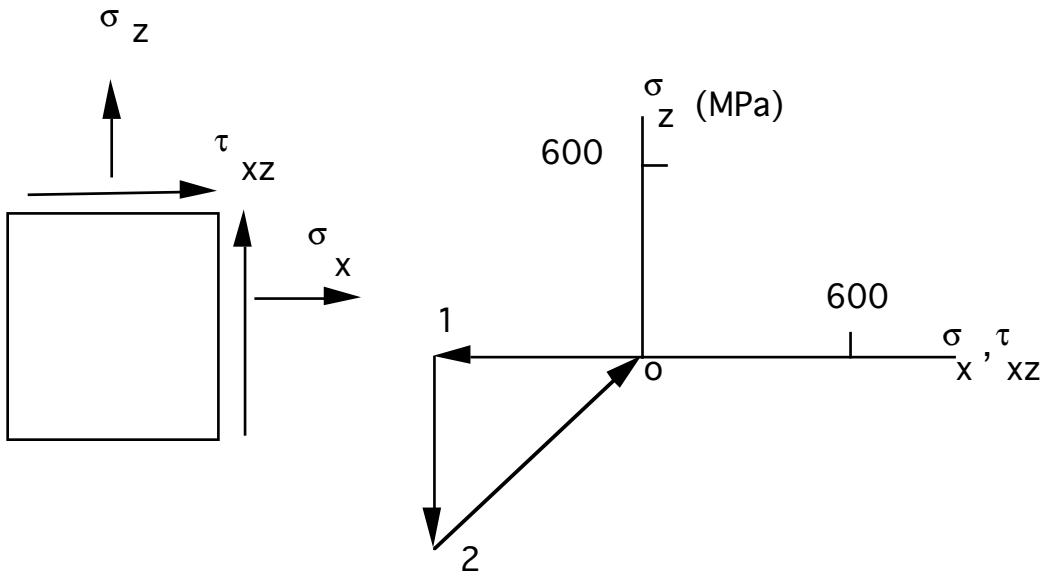
TAM 554 - Plasticity **Name_____**
Homework #2 **Due September 25, 2019**

1. Consider the state of stress imposed on the cube of element shown below. Normal stresses in the x and z directions and shear stresses in τ_{xz} are applied and the material is restrained in movement in y-direction $\varepsilon_y = 0$.
The stress path is shown below (0-1-2-0). At point 1 $\tau_{xz} = \sigma_x = -600$ MPa. At point 2
$\tau_{xz} = \sigma_x = -600$ MPa, $\sigma_z = -600$ MPa.

Using Prandtl-Reuss equations and Von Mises yield criteria determine the complete stress-strain levels in all directions for E = 200,000 MPa, H = 20,000 MPa, Y = 430 MPa, $\upsilon = 0.3$. Y = initial yield stress; H = Plastic Modulus.



Bonus: Try to do the same problem with Hencky equations and compare your results.

2. As a possible yield criterion of isotropic metals, it is postulated that the numerically largest deviatoric principal stress attains a critical value at yielding. Show that the yield locus is a regular hexagon whose sides are inclined at 30^o to those of the Tresca hexagon. If the new hexagon is made to circumscribe the Mises circle, prove that the new yield criterion is expressible in the form

$$k^2 (J_2 - k^2)^2 = J_3^2$$

where k is the yield stress in pure shear. What is the corresponding relationship between k and Y? How does this relationship compare to that of Tresca and Von Mises?