# 16.21 - Techniques of structural analysis and design
Homework assignment # 4
# Handed out: 3/4/05
Due: 3/11/05

March 4, 2005

Solidworks practice problem (Compliments of C. Graff.) Create a solid model for each of the following objects using Solidworks (you may turn in your file electronically for feedback purposes).

- Wooden Pencil:

- Door Hinge

Door Hinge

1.5"

2.0"

1.5"

φ = 0.375"
(×3)

R = 0.375"

t = 0.125"

2.5"

0.5" 0.5"

1.5"

1.5"
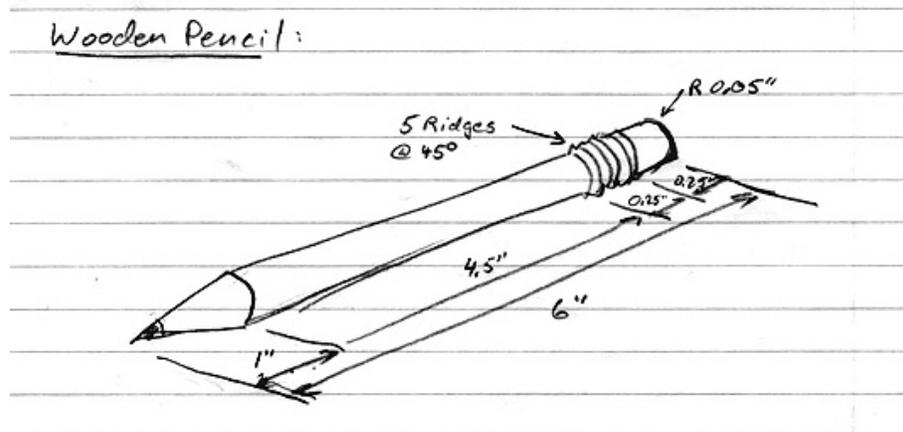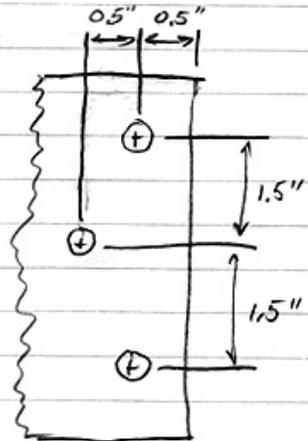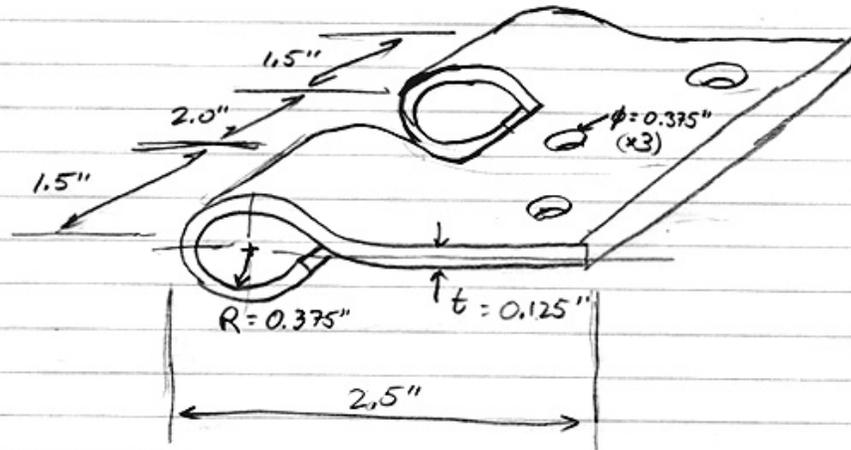
1. Consider the block of material shown in the figure. Determine the complete elasticity solution, i.e., all the elastic fields $\mathbf{u}, \sigma, \epsilon$, when the block is subjected to the imposed displacement δ as shown in the figure. The block is made of a material that can be modeled as elastic and isotropic with Young's Modulus E and Poisson's ratio ν. Assume perfect sliding at the interface between the block and the walls. Two different scenarios are to be considered:

    (a) $d << L, d << w$ and the lateral walls of the block–those determined by the equation of the planes $x_2 = \pm\frac{d}{2}$–are unrestrained in the x_2 direction, i.e. the plate can expand out of its plane.

    (b) The lateral walls of the block are not allowed to expand out of its plane.
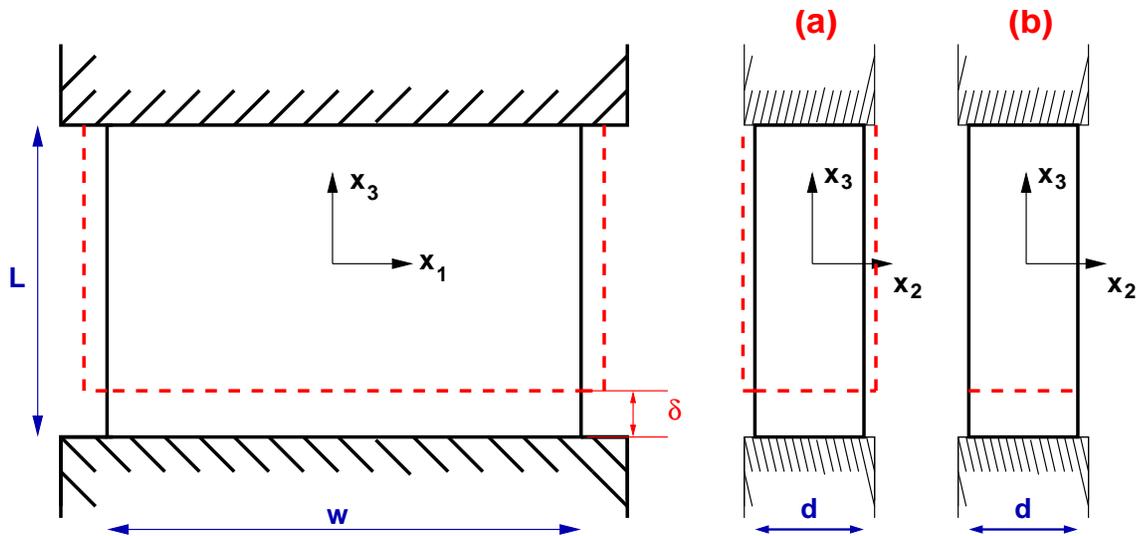
2. Problem 4.4 from textbook

3. Problem 4.6 from textbook but change the complementary strain energy to the strain energy

4. Problem 4.7 from textbook

5. Obtain a numerical value for the elastic energy stored in the block of problem 1 when $L = 10cm, w = 10cm, d = 1mm, E = 70GPa, \nu = 0.3, \delta = 2mm$. Consider both cases of plane strain and plane stress.