Problem Session 2 – Friday, January 19

Applying optimization to a design problem; this problem will reinforce what you have learned about optimization.

Solve the following optimization problem using Excel. In your write up, respond to the following.

What is the objective function?

What are the constraint equations?

What are the elements of the Lagrangian gradient vector?

What are the elements of the Hessian matrix?

A beam of uniform rectangular cross section is to be cut from a log having a circular cross section of diameter 2a. The beam has to be used as a cantilever beam (the beam length is fixed) to carry a concentrated load at the free end. Find the dimensions of the beam that correspond to the maximum bending stress carrying capacity. Let the bending moment, M be 1000 in/lb. and the radius of the log, a = 12 inches.



Helpful equations

 $\sigma/y = M/I$

I = area moment of inertia M = bending moment y = distance from neutral axis

 $I = 1/(12*b*h^3)$

$$x^2 + y^2 = a^2$$