Last Updated: February 26, 2016 at 11:01am

Name:

Homework 5

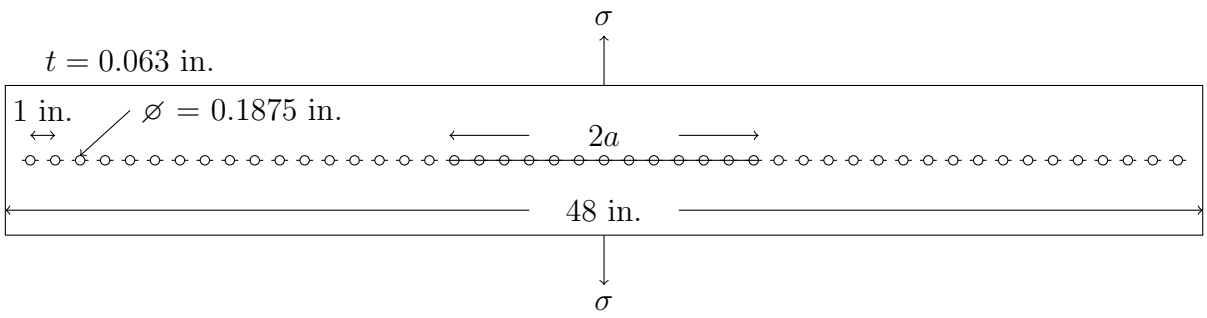
Due 1 Mar 2016

1. Plot the residual strength of the bolted lap joint shown. Compare the following cases
   (a) Net Section Yield
   (b) Brittle Fracture
   (c) Linkup
   (d) Modified Linkup

   Where the MSD crack length $c = 0.05$ in.. Compare Al 2024-T3, Al 2524-T3, and Al 7075-T6, using the data in Table 1. Although β will be a function of crack length, assume $\beta_a = 0.934$ and $\beta_l = 2.268$ for these calculations.

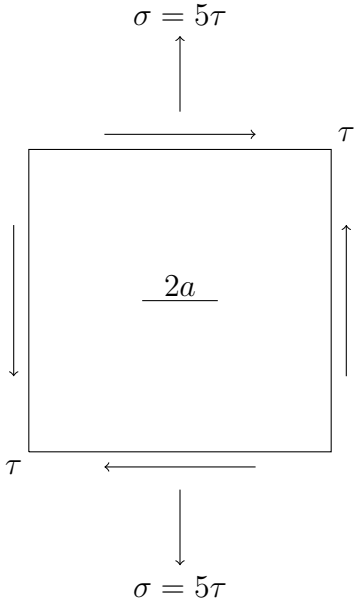
Table 1: Material properties for Problem 1

Material	σ_{YS}(ksi)	K_C(ksi$\sqrt{\text{in}}$)
2024-T3	40	120
2524-T3	40	140
7075-T6	63	60



2. For the following panel assume $K_{IC} = 60$ ksi$\sqrt{\text{in}}$ and $a = 0.5$ in.
   (a) Determine the critical values of σ and τ as well as the crack extension angle using the maximum circumferential stress criterion.
   (b) Determine the critical values of σ and τ as well as the crack extension angle using the principal stress criterion.

   Note: Assume $\beta = \beta' = 1$



3. An aluminum beam has a 0.3" crack in the upper flange as shown. Estimate the mixed-mode stress intensity factor.
   Note: Assume $K_{II} = \tau\sqrt{\pi a}$.