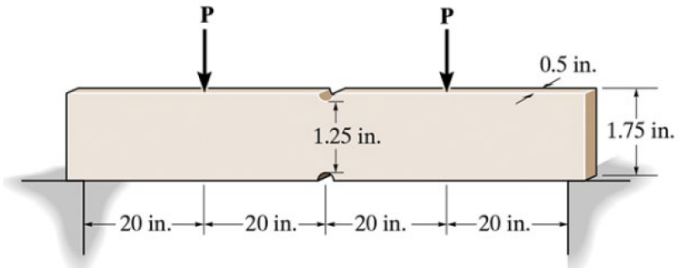
Problem 3 Stress Concentrations - Bending (25pts)
The simply supported notched bar is subjected to the two loads, each having a magnitude of P = 100lbs. Determine the maximum bending stress σ developed in the bar and sketch the bending stress distribution acting over the cross section at the center of the bar. Each notch has a radius of r = 0.125in. Run statics and draw the shear and moment diagrams in terms of P and L. Submit a copy of the stress concentration graph used indicating how K was obtained. Show all calculations to receive full credit.



Problem #3

P = 100 lbs

r = 0.125 in

$M = 100\ lbs\ (20) = 2000\ lbs$

$F_y \quad d_x$

$n = \frac{1.75 - 1.25}{2} = 0.25$

$\frac{n}{r} = \frac{0.25}{0.125} = 2.0$

$\frac{r}{h} = \frac{0.125}{1.25} = 0.1$

$K = 2.1$

$\sigma_{max} = K \frac{Mc}{I}$

$I = \frac{wh^3}{12} = \frac{0.5(1.25)^3}{12}$

$I = 0.08134$

$\sigma_{max} = 2.1 \left(\frac{2000\left(\frac{1.25}{2}\right)}{0.08134} \right) = 32.256\ ksi$