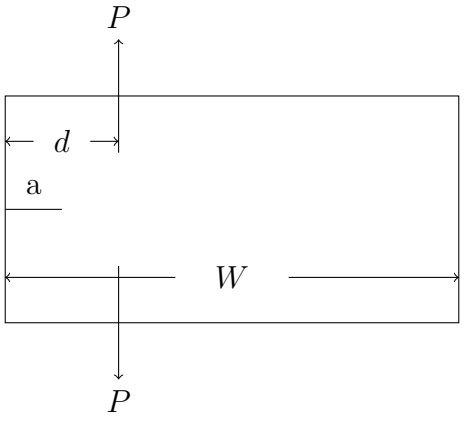
Name:

Exam 1

1. (25 pts.) Estimate the stress intensity factor in the panel shown below. Express your answer in terms of known stress intensity factors.



2. (25 pts.) A large sheet of some new metal alloy (2 in. thick) containing a center-crack with length $2a = 4$ in. fractures under remote tensile stress of $\sigma = 80$ ksi. This material has a yield strength of 100 ksi.

   Note: If you feel you cannot answer any of the following questions with the given data, explain why not. Also, as before, any time iteration is necessary, indicate it but only perform the iteration once.

   (a) What is the fracture toughness for this sheet?

   (b) What is K_{IC} for this material?

   (c) What would the failure stress be if the crack was only 0.5 in.?

   (d) What remote stress, σ will fracture an identical plate with a 6 in. crack?

   (e) What is the failure stress for a 3-in. long center crack in a 1.5-in. thick plate?

3. (25 pts.) Use a labeled sketch to describe the theoretical basis for predicting residual strength of panels with multiple site damage. **Note:** You do not need to derive any equations, but you should at least describe the equations that would need to be derived and where you would start.

4. (25 pts.) The residual strength curves for stiffened panels below show residual strength for two different skin and stifferener configurations. How do they differ in residual strength and critical crack length? Identify regions of unstable and stable crack growth. What are the advantages and disadvantages to each configuration?