Problem 3.1 (3.17 text)

A simply supported beam of length $L$ carries a uniform load per unit length, $w_0$, over a portion of the length, $\beta L < x < L$

i) Determine the reactions at the supports.

ii) Draw two free body diagrams, isolating portions of the beam to the right of the origin. Note: include all relevant dimensions as well as known and unknown force and moment components.

iii) Apply force equilibrium and find the shear force $V$ as a function of $x$. Plot.

iv) Apply moment equilibrium and find how the bending moment $M_b$ varies with $x$. Plot.

v) Verify that $dM_b/dx = -V$ within each region.

Problem 3.2 (See Bible for Fall 98)

A simply supported beam (indicated by the rollers at the ends) carries a trolley used to lift and transport heavy weights around within the shop. The trolley is motor powered and can move between the ends of the beam.

For some arbitrary location of the trolley along the beam, $a$,

(i) What are the reactions at the ends of the beam?

(ii) Sketch the shear force and bending moment distributions.

(iii) How does the maximum bending moment vary with $a$; i.e., change as the trolley moves from one end to the other?

Problem 3.3 (See Bible for Fall 98)

Estimate the maximum bending moment in the wood of the clothespin shown full size. Where do you think this structure would fail?