Name _____ Team _____ Section ____

Problem Set 6
Due February 25, 1999

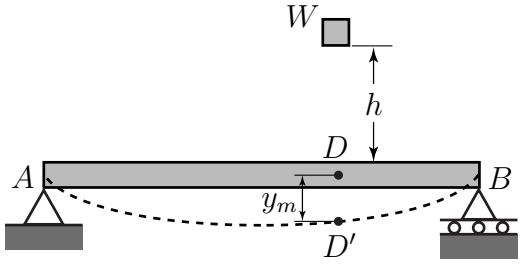
Professors Gray & Costanzo Spring 1999

Problem 1

It is shown in mechanics of materials that when an elastic beam AB supports a block of weight W at a given point D, the deflection y_{st} of point D (called the static deflection) is proportional to W. Show that if the same block is dropped from a height h onto the beam and hits it at D, the maximum deflection y_m of point D in the ensuing motion may be expressed as

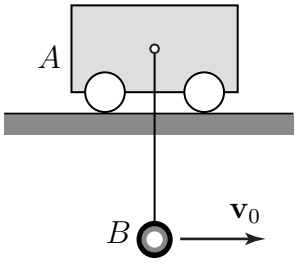
$$y_m = y_{\text{st}} \left(1 + \sqrt{1 + \frac{2h}{y_{\text{st}}}} \right).$$

Note that this formula is approximate, since it is based on the assumption that the block does not bounce off the beam and that no energy is dissipated in the impact.



Problem 2

Ball B, of mass m_B, is suspended from a cord of length l attached to cart A, of mass m_A, which may roll freely on a frictionless horizontal track. If the ball is given an initial horizontal velocity $\mathbf{v}_0$ while the cart is at rest, determine *(a)* the velocity of B as it reaches its maximum elevation, *(b)* the maximum vertical distance h through which B will rise.



Problem 3

A 15 lb block B starts from rest and slides on the 25 lb wedge A, which is supported by a horizontal surface. Neglecting friction, determine *(a)* the velocity of B relative to A after it has slid 3 ft down the inclined surface of the wedge, *(b)* the corresponding velocity of A.