Homework #8

Due Monday 5 November 2001

Reading and problems are taken from R.C. Hibbeler, *Engineering Mechanics Dynamics*, Ninth Edition, Prentice-Hall, 2001.

Reading: Chapter 16.7-16.8

Problems:
1. (10 points) 16-109
2. (10 points) 16-111
3. (10 points) 16-118
4. (10 points) 16-126
5. (10 points) As shown in the figure below, the straight bar rotates about the hinge at a constant angular velocity ω. The collar has mass m and can slide along the bar without friction. Determine the distance of the collar from the hinge, assuming the initial distance to be x_0. By examining your result, what can you say qualitatively about the motion of the collar relative the bar?
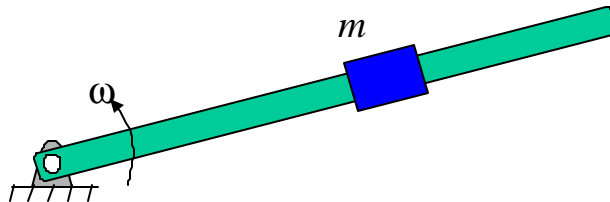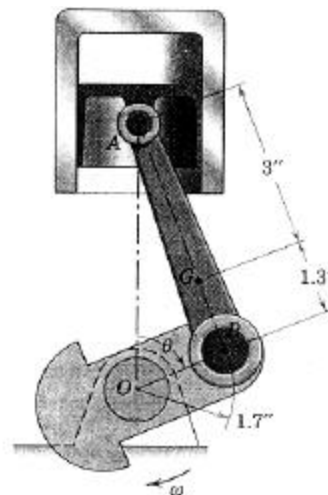

Adams Problem:
(10 points) Consider problem 6/107 from Meriam (see below). Use Adams to solve for the maximum forces at piston pin A and crank pin B. Submit plots of the forces over a full revolution of the crank. Also, submit an isometric view of your model.

6/107 The connecting rod AB of a certain internal combustion engine weighs 1.2 lb with mass center at G and has a radius of gyration about G of 1.12 in. The piston and piston pin A together weigh 1.80 lb. The engine is running at a constant speed of 3000 rev/min, so that the angular velocity of the crank is $3000(2\pi)/60 = 100\pi$ rad/sec. Neglect the weights of the components and the force exerted by the gas in the cylinder compared with the dynamic forces generated and calculate the magnitude of the force on the piston pin A for the crank angle $\theta = 90°$. (*Suggestion:* Use the alternative moment relation, Eq. 6/3, with B as the moment center.)

Ans. $A = 347$ lb

Problem 6/107