Your Name: _____

Your TA name: _____

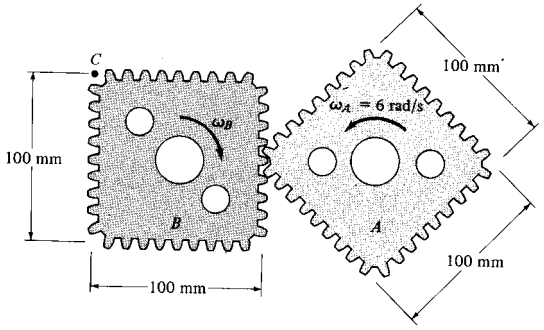
Section day: _____

MAE325, Homework 4 (v1.1)

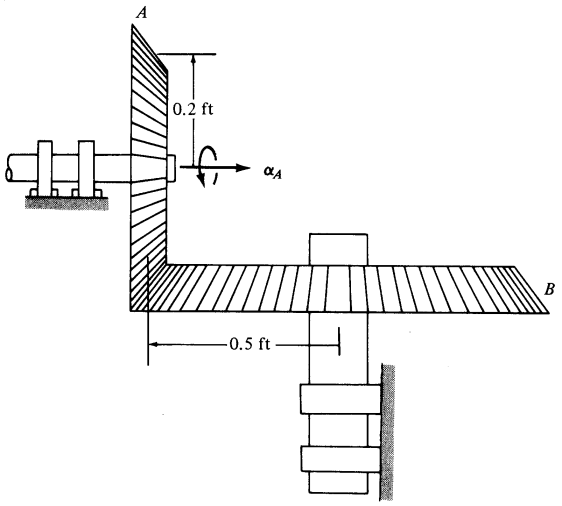
(Due Wednesday, September 22, 1999, 9:04 AM)

Please follow the homework directions from the course WWW pages, the directions of the first homework, and the advice marked on your graded homework.

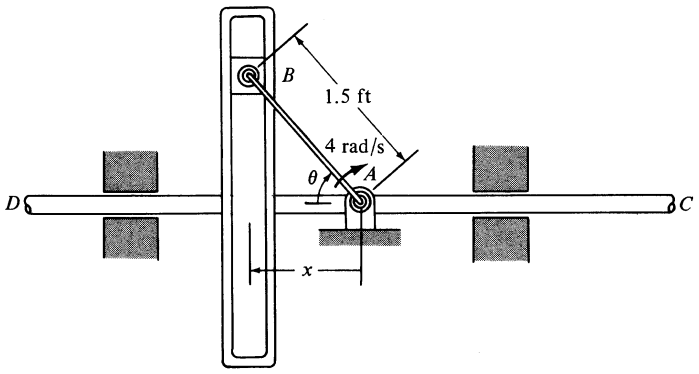
1. At the instant shown,gear A is rotating with a constant angular velocity of $\omega_A = 6 rad/s$. Determine the largest angular velocity of gear B and the maximum speed of Point C. (Look at the pushbutton mechanism in the second floor Upson hallway.)



2. Gear A is in mesh with gear B as shown. If A starts from rest and has a constant angular acceleration of $\alpha_A = 2 rad/s^2$, determine the time needed for B to attain an angular velocity of $\omega_B = 50 rad/s$.



3. The mechanism is used to convert the constant circular motion of rod AB into translating motion of rod CD. Compute the velocity and acceleration of CD for any angle θ,$dot\theta$, $\ddot{\theta}$ of AB.



4. Consider a bicycle rider's leg as part of a planar 4 bar linkage consisting of the thigh (upper leg), shank (calf or lower leg), crank, and the bike frame up to the riders seat. This model neglects the flex of the ankle which we think of as locked. The four hinges in this 4-bar linkage are the hip joint, the knee joint, the pedal bearing and the crank axle. For simplicity assume that the hip is 30 inches directly above the crank and that at the moment in question the crank is horizontal with the pedal axle 8 inches in front of the crank. The shank is 20 inches long and the thigh is 18 inches long. Assume the crank is rotating at a constant 60 revolutions per minute and the rider is going to the right. What are the angular velocities of the thigh and shank, and what is the velocity of the knee relative to the bike? What are the angular accelerations of the knee and shank? [hint: unlike in the lecture example, here you first have to do the tricky geometry/trigonometry problem of finding the knee.]