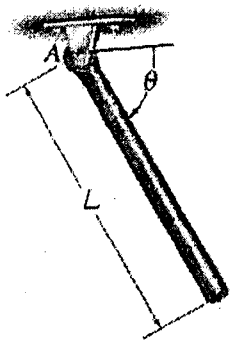
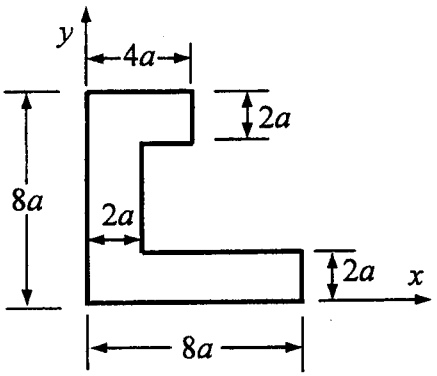
1. (25%) The slender rod as shown has a mass m and length L and is released from rest when $\theta = 0$. Determine the horizontal and vertical components of the reaction forces at the pin at the instant $\theta = 90^\circ$. The moment of inertia of the rod about point A is $I_A = \frac{1}{3}mL^2$.



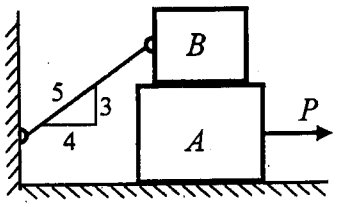
(Hint: the kinematics equation $\omega\, d\omega = \alpha\, d\theta$ may be useful, where $\omega = d\theta/dt$, $\alpha = d^2\theta/dt^2$)

2. (20%) A satellite of mass m is in a circular orbit of radius $2R$ about the earth center, where R is the earth's radius. Then a constant thrust $F = mg_0/8$ (g_0 is the gravitational acceleration at the earth's surface) is applied to the satellite, always being directed toward the center of the earth. Find the minimum distance from the earth center and the maximum velocity of the satellite in the resulting motion.

3. (15%) For the cross section shown, find the moments of inertia I_{xx}, I_{yy}, and the product of inertia I_{xy}.



4. (20%) The weights of blocks A and B are, respectively, $W_A = 150$ N and $W_B = 170$ N. Block B is held to a wall by a cable. If the coefficient of static friction at all surfaces of contact is 0.2, determine the force P needed to move block A.



5. (20%) If each cable segment can support a maximum tension of 150 lb, determine the largest load P that can be applied. Also determine the tension in each cable segment.