1. (25%) The bicycle and rider have a mass of 80 kg with center of mass located at *G*, and the coefficient of friction at the rear tire is μ_B=0.8.
   (a) As the rear wheel locks for braking, determine the normal reactions at the tires *A* and *B*, and the deceleration of the rider.　(15%)
   (b) What is the normal reaction at the rear wheel when the bicycle is traveling at constant velocity and the brake is not applied?　(10%)
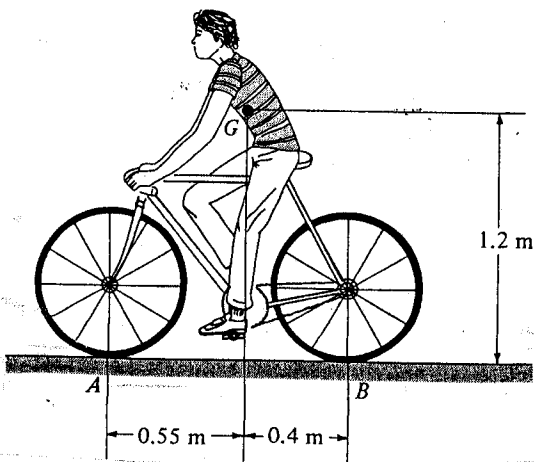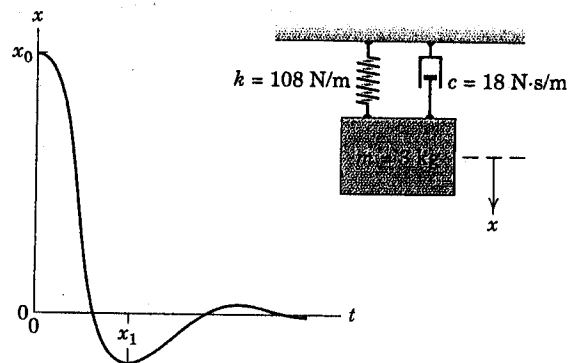

2. (25%) The homogeneous solid semi-cylinder is released from rest in the position shown. If friction is sufficient to prevent slipping, determine the maximum angular velocity ω reached by the cylinder as it rolls on the horizontal surface.
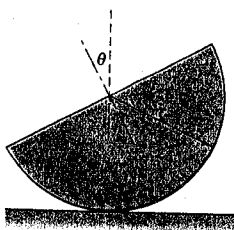
3. (25%) Please write down the expressions of velocity and acceleration in polar coordinate systems. Do the axes of polar coordinates change directions? Do the previous formulas represent ABSOLUTE or RELATIVE velocity and acceleration? Explain your reason in detail.

(請以中文作答)

4. (25%) The system shown is released from rest from an initial position x_0. Determine the overshoot displacement x_1. Assume translational motion in the *x*-direction.