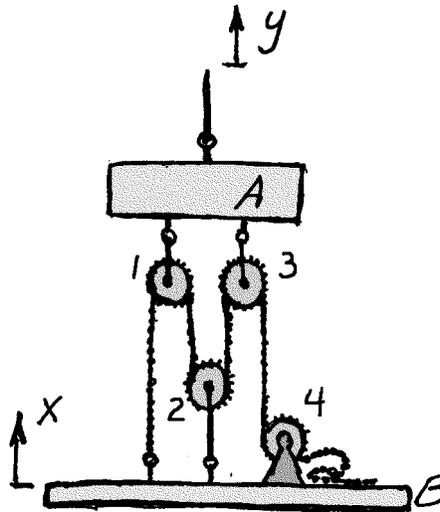


ME 104, Spring 2004, Test 1, 3/3/04

HONOR PLEDGE - I pledge my honor that during this examination I neither gave nor received assistance.

Name: _____ Signed: _____

1. Explicitly state what you're solving for and how. Box your answers. One word answers aren't acceptable. They'll get zero credit, whether correct or not. Demonstrate clearly that you know what you're doing - don't leave me guessing. These are general instructions. Now go on to the next item - the first real question.
2. The device shown consists of an upper part A which is being raised at a rate of $\dot{y} = 8$ m/s. A chain connects the platform B to A and meshes with the 3 toothed pulley gears labeled 1, 2 and 3. A driven gear (4) on the platform B rotates counterclockwise, taking in chain at a rate of 8 m/s. Determine \dot{x} .



3. You're in a spacecraft that's orbiting the earth. To pass the time, you observe the spacecraft's speedometer and notice that your fastest speed is 4 times your slowest. You also know that the closest you get to the earth is 400 km above its surface. What's the farthest away from the earth that you get?

4. The figure shows a particle A of mass m moving along on the inside of a cylindrical container with radius r . It is moving fast enough to retain contact with the interior surface of the cylindrical wall. The coefficient of friction is μ .

(a) What constraints exist on the motion?

(b) Construct a cylindrical coordinate system and write down the equations of motion that describe A 's path. Be specific enough so that the equations could be directly implemented in MATLAB and then numerically integrated to find the trajectory without any further work beyond typing the them into an M-file, choosing t span and an initial condition vector and then integrating with `ode45`.

