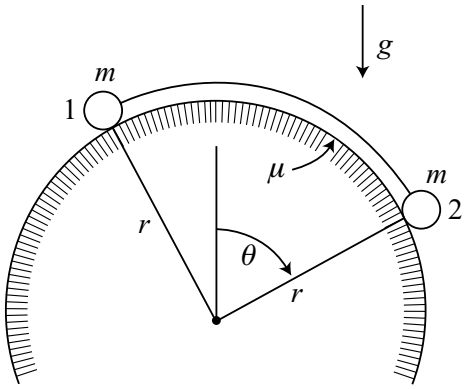
TAM 212 Homework 3

1. Do question 1/46 from Ardema (p. 38).

2. Two particles, each of mass m, are connected by a massless cord of length $\frac{1}{2}\pi r$ on a fixed horizontal cylinder of radius r. There is a coefficient of dry friction μ for sliding of the particles on the cylinder, so that the friction force is has magnitude μN, where N is the magnitude of the normal force. We will assume that $0 \leq \theta \leq \frac{\pi}{2}$ and $0 < \mu < 1$.



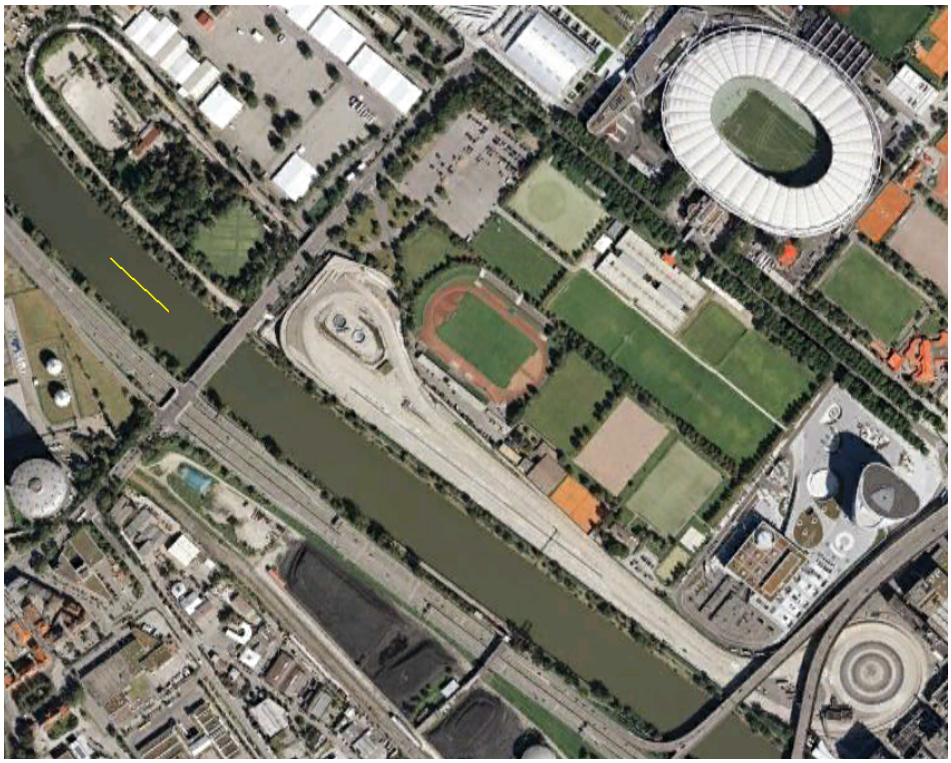
   (a) Draw a free body diagram for each mass and clearly label all forces.

   (b) Obtain the equation of motion for θ, assuming that $\dot{\theta} > 0$ and the particles remain in contact with the cylinder.

   (c) Solve for the tension T in the cord as a function of θ.

3. Pictured below is a bus driving on the Mercedes Benz test track at their Untertürkheim plant.

The photo was taken on the north-west curve in the track, which is in the upper left of the satellite image below. For reference, the yellow line in the river is 100 m long.



Compute your best estimate for the speed of the bus at the time shown.