

## Homework #1

phy 5246

due: Wednesday, September 3 (in class)

P1: Consider water coming vertically down of a circular water faucet with radius  $a$ . When it just leaves the faucet head its speed is  $v_0$ . Find the functional form of the shape that the water takes below the faucet assuming laminar flow and that the faucet head is perfectly horizontal. Draw your answer.

P2: Two masses,  $m_1$  and  $m_2$  are connected by a negligibly light but very strong rod of length  $\ell$  which does not stretch or compress. Assume that  $m_1 > m_2$ . A person standing on the platform at height  $h$  above the ground holds on to  $m_1$  and whirls this contraption by moving  $m_2$  up and down along a circle. The person releases  $m_1$  when  $m_2$  is up and exactly vertical. Solve the equations of motion, describe the motion of the system, and draw your answer.

P3: A particle of mass  $m$  is released from rest and falls down under the influence of (constant) gravitational field. Assume that the frictional force due to the air in the atmosphere is proportional to the speed of the particle with a proportionality constant  $\kappa$ . Solve the equations of motion and determine the terminal velocity.