Problem 1. (10 pts) A wheeled cart rolls without friction down a long, long plane inclined at $\theta = 25^\circ$ to horizontal. The cart is $H = 1.5\, \text{m}$ tall, $L = 2\, \text{m}$ long, and $W = 1.5\, \text{m}$ wide in the out-of-page direction. The top of the cart is open to the atmosphere. Suppose that it is raining hard enough to fill the cart with water easily. How much water will the cart hold?

![Cart on Inclined Plane](image)

Problem 2. (10 pts) Water flows from left-to-right at uniform speed $V = 60\, \text{cm/s}$ through a circular pipe with diameter $D = 2\, \text{cm}$. Suppose that your finger can be modeled as a cylinder with diameter $d = 1.4\, \text{cm}$ that has a hemispherical tip. How much power do you need to apply to your finger to push it up the center of the pipe at speed $V_f = 1.5\, \text{cm/s}$? Ignore frictional effects, and assume that the water velocity as it leaves the pipe and enters the atmosphere is also uniform. Describe two ways to solve this problem, then solve it in the more convenient way.

![Pipe with Finger](image)

Problem 3. (10 pts) Text, problem 6.27.