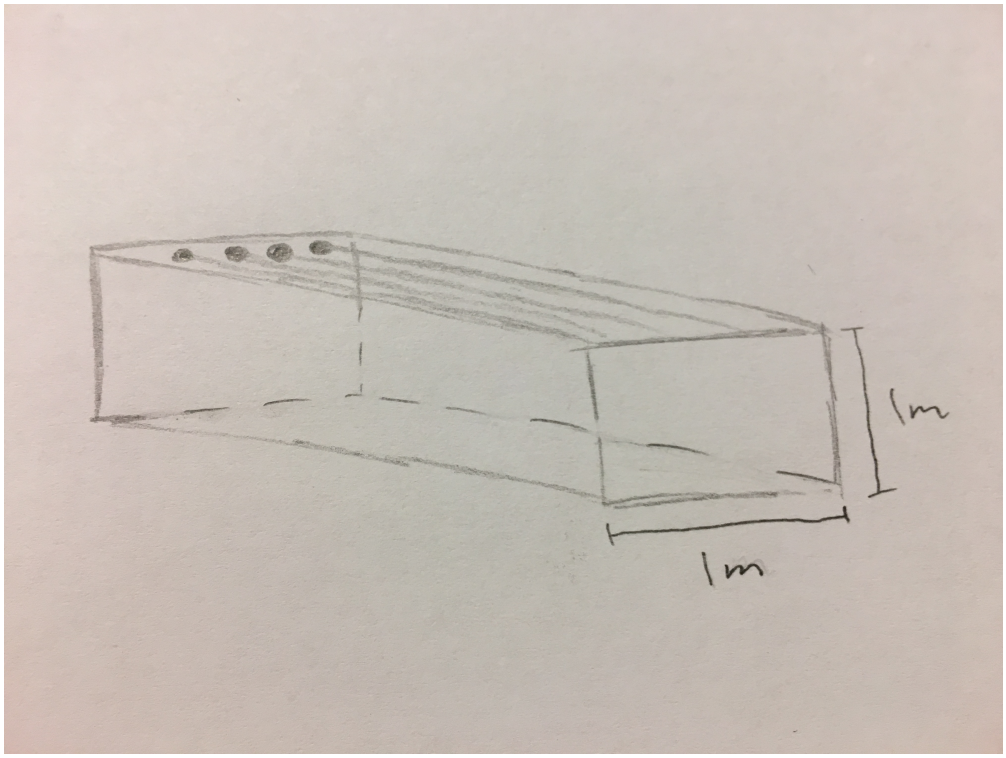
Physics 426 - Fluid Mechanics

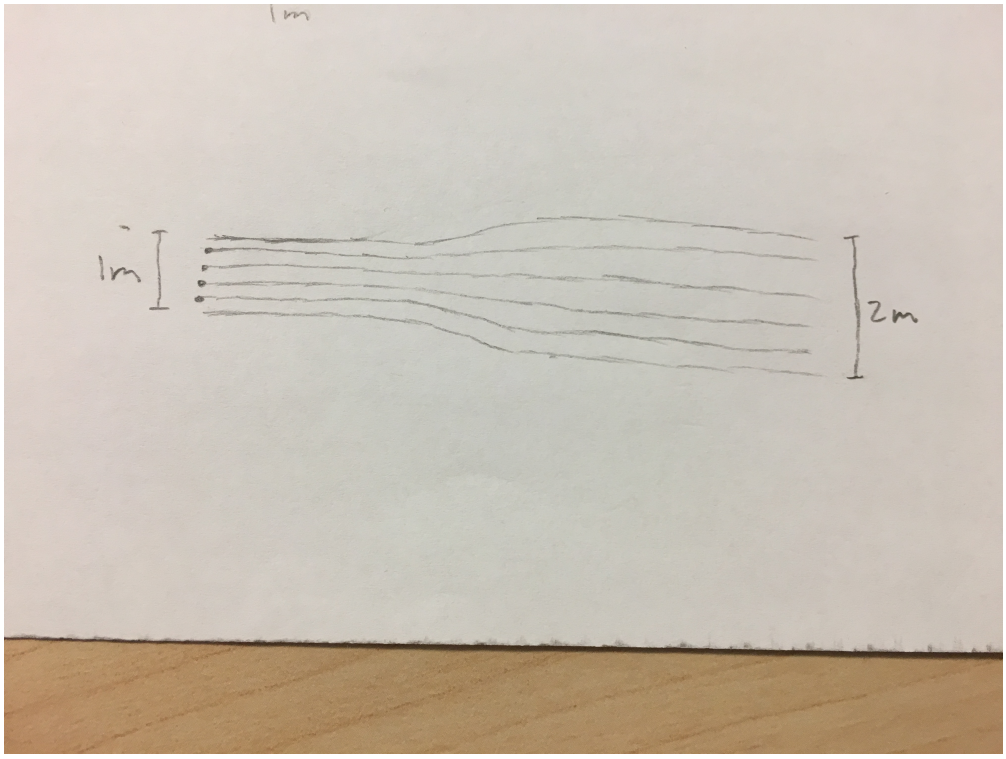
Reading: Week 2

Q1: Steady flow in channel



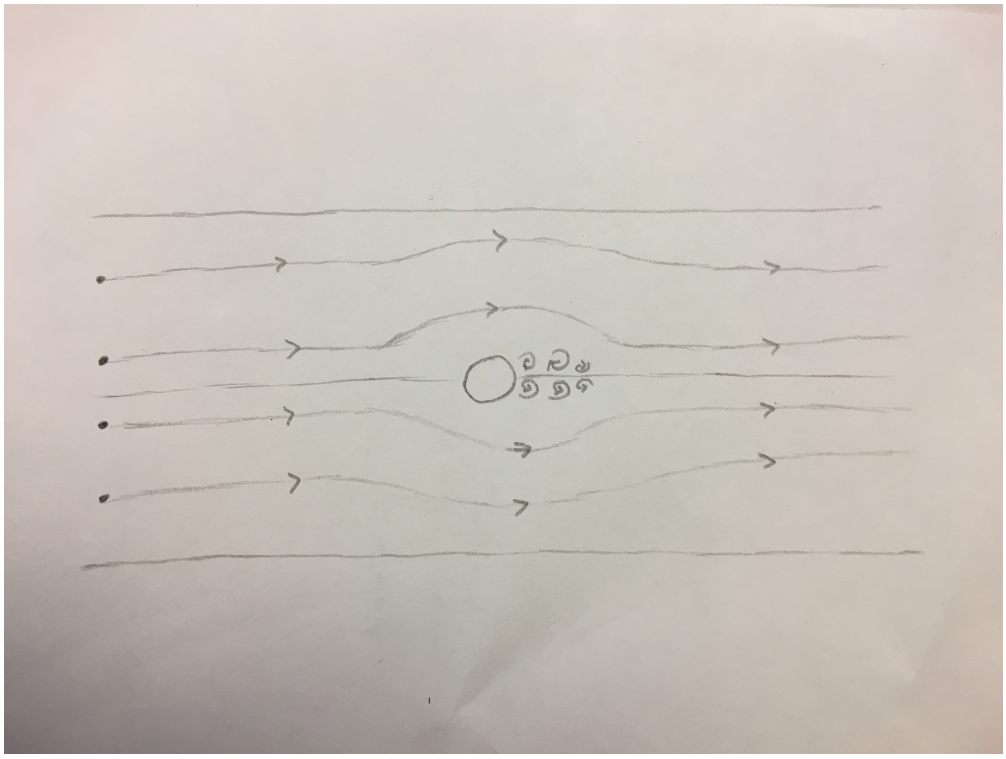
- The dye travels in a straight line parallel to the rectangular channel.
- If there is no friction and the water doesn't accelerate or decelerate there is no energy required to keep the flow moving (assuming it is initially in motion). Since there are no forces acting on it no energy is required.
- If there is friction and the flow is still steady the force action on the water to keep it moving down channel could be gravity. For it to be gravity though there would need to be a potential energy gradient in the channel. This is how rivers flow.

Q2: Widening channel



- The dye will spread out as the the channel widens. I believe the water would follow these paths because as the channel widens the fluid needs to fill the new space, in accordance with how we defined a fluid in class.
- The energy per unit volume is conserved.
- I believe pressure would be the force (per unit area) to change to flow speed in this situation. While pressure is a force per unit area the decrease in pressure would cause a decrease in flow speed.

Q3: Flow around a cylinder



- The deformation of the flow (the fact the flow moves around the cylinder) is caused by the normal force of the surface of the cylinder. The force is then translated through the rest of the fluid by the pressure in the fluid.
- The net rate of work necessary to pull the cylinder through water needs to be equivalent to the force of fluid friction.