

## Fluid Mechanics - 1

A system to provide a water jet at station 3 is shown. When the valve is opened, a jet of water will be produced at station 3.

Show all analysis and work, and mark answers clearly. Problems are 20 points each.

- a. **(20 points)** Before the valve is opened, what is the pressure at station 2?
- b. **(20 points)** When the valve is opened, assuming steady flow with the water in the tank at the level shown, what is the velocity  $V_3$  at station 3? Assume a 10% loss of fluid head ( $z$ ) in the pipe due to friction. Neglect the valve loss.
- c. **(20 points)** With the 10% flow losses, what is the pressure  $p_2$  with the valve open?
- d. **(20 points)** What is the mass flow of water?
- e. **(20 points)** What is the magnitude and direction of the reaction force due to the jet of water at the mounting base? As an approximation, use the pressure at  $p_2$ .

