## **Ideal Mixing Problems**

Consider the ideal mixing of some solute, say salt, in a solvent, say water. We set up a tank of volume V, where this solution will be assumed to be mixed instantaneously. We assume an unmixed solvent/solute combination to enter the tank where the density of the solute is ,  $\rho_{in}$ , and the flow-rate of the unmixed combination is  $f_{in}$ . After mixing we allow the solution to flow out at a rate of  $f_{out}$  and we ask the question, what is the mass of solute, y, in the tank at time t? To do this we consider the following cases,

- $f_{\text{in}} < f_{\text{out}}$
- $f_{\text{in}} = f_{\text{out}}$
- $f_{\text{in}} > f_{\text{out}}$

by establishing an ODE via concentration of mass.