mass balance, difference form

$$\Delta M = \Delta M_{\text{in}} - \Delta M_{\text{out}}$$

mass balance, differential form

$$\frac{dM}{dt} = \dot{M}_{\text{in}} - \dot{M_{\text{out}}}$$

energy balance, difference form

$$\left[U + m\left(\frac{v^2}{2} + gh\right)\right]_f - \left[U + m\left(\frac{v^2}{2} + gh\right)\right]_i = Q + W_S + W_{PV} \ldots + \sum_{k=1}^{K} \Delta m_k \left(\hat{U} + P\hat{V} + \frac{v^2}{2} + gh\right)_k$$

entropy stuff

$$\Delta \underline{\text{S}}_{\text{ideal gas}} = C_p^* \ln\left(\frac{T_2}{T_1}\right) - R \ln\left(\frac{P_2}{P_1}\right)$$

$$\Delta \underline{\text{S}}_{\text{Liquid}} = C_p^* \ln\left(\frac{T_2}{T_1}\right)$$