Chapter 4

4-1 Eulerian Description

- Pressure Field: $P = P(x, y, z, t)$
- Velocity Field: $\vec{V} = \vec{V}(x, y, z, t)$
- Acceleration Field: $\vec{a} = \vec{a}(x, y, z, t)$

where the rate of change of the particle's x-position with respect to time is u and similar to y(v) and z(w)

$$\vec{a}(x, y, z, t) = \frac{\partial \vec{V}}{\partial t} + u\frac{\partial \vec{V}}{\partial x} + v\frac{\partial \vec{V}}{\partial y} + w\frac{\partial \vec{V}}{\partial z}$$

and in Cartesian coordinates, we could get that

$$\begin{cases} a_x = \frac{\partial u}{\partial t} + u\frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} + w\frac{\partial u}{\partial z} \\ a_y = \frac{\partial v}{\partial t} + u\frac{\partial v}{\partial x} + v\frac{\partial v}{\partial y} + w\frac{\partial v}{\partial z} \\ a_x = \frac{\partial w}{\partial t} + u\frac{\partial w}{\partial x} + v\frac{\partial w}{\partial y} + w\frac{\partial w}{\partial z} \end{cases}$$