Chapter 1

Classical Mechanics

1.1 The Basic Notions

what happens, what it is.

space

< to put anything necessary into it, not more, nor less.>

a set.

its element is point. why point? just for overlap of position-a prerequisite to apply Euclid geometry.

there are 3 dimensions (free degrees). why 3? we see it.

⇒a real vector space $\mathbb{R}^3$ as an translation group act on an affine space $\mathbb{A}^3$. and the elements of $\mathbb{R}^3$ are defined as the distance between two elements of $\mathbb{A}^3$.

time

before we can find any difference, we can make space+time as a 4 dimensions affine space $\mathbb{A}^4$, and a translation group $\mathbb{R}^4$ act on it.

the measurement of time: a linear map $t : \mathbb{R}^4 \mapsto \mathbb{R}$.

a simultaneity event space $\mathbb{A}^3$ is a subspace of $\mathbb{A}^4$ means that if $(a, b) \subset \mathbb{A}^3$, then $t : (b - a) = 0$, such a $\mathbb{R}^3$ is the core of map t.

the distance:

$$\rho(a, b) = \|a - b\| = \sqrt{(a - b, a - b)}; (a, b) \subset \mathbb{A}^3$$

then, we name $\mathbb{A}^4$ a **Galileo space**.

we get Galileo group which act on Galileo space but make map t and ρ is invariant.

velocity

momentum
force
acceleration
angular momentum
potential
energy