

Lecture Jan 10 PHY 321

$$\text{length} = [L] \quad ([x])$$

Dimension

Typical unit : m

$$\text{mass} = [M]$$

unit kg

$$[K] = \text{kinetic energy}$$

unit $\text{kg m}^2/\text{s}^2$

$$\text{time} = [T]$$

$$\text{velocity} = [v] = \frac{\text{length}}{\text{time}}$$

$$\text{acceleration} = [a] = \frac{\text{length}}{\text{time}^2}$$

$$\text{Force} = [F] = \frac{\text{mass} \times \text{length}}{\text{time}^2}$$

Newton's law :

$$F = ma$$

$$a = \frac{dv}{dt} = \frac{dr}{dt^2} =$$

$$\frac{d}{dt} \left(\frac{dr}{dt} \right)$$

introduce dimensionless

time $\tau = \alpha \cdot t$

$$[\alpha] = ? = \frac{1}{\text{time}}$$

$$F = m \cdot \frac{d^2 r}{dt^2} \quad t = \frac{\tau}{\alpha}$$

$$= m \alpha^2 \frac{d^2 r}{d\tau^2}$$

$$\frac{F}{m \alpha^2} = \frac{d^2 r}{d\tau^2}$$

dimension length

$$F = - \frac{G m_1 m_2}{r^2}$$

$$[G] = \frac{|\vec{r}_1 - \vec{r}_2|^2}{\text{length}^3 \text{ mass time}^2}$$