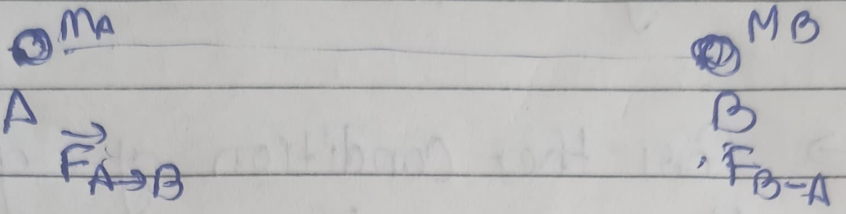
- Kepler's ~~first~~ law
  - → Orbit are only nearly circular
  - → Fit all the orbits to elliptical trajectories where orbit are closed.

- Universal pattern commons to all planetary motion

- Motion of kinematic of planet is independent of the mass of the moving body



Newton third law

$$\vec{F}_{B\to A} \propto m_A$$

$$\boxed{F_{A\leftrightarrow} \propto m_A m_B}$$

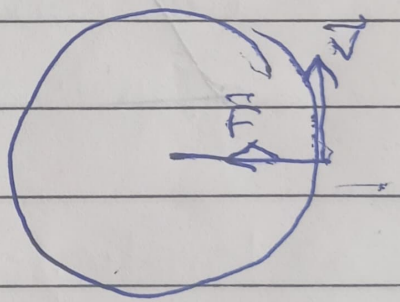
Circular Orbit

$$\vec{F} \propto -\vec{r}$$

$$\vec{F} = -G M_A M_B \vec{r} f(r)$$

↑ +ve

$f(r) \propto r^n$



acceleration is inward

$$F = m\omega^2 r = m f(r) =$$

$$\omega^2 r = k f(r)$$

$$\omega = \frac{2\pi}{T} \Rightarrow \omega^2 = \frac{4\pi^2}{T^2}$$

$$\Rightarrow \frac{(2\pi)^2 r}{T^2} = k f(r)$$

$$\Rightarrow \left(\frac{r}{T^2} = k' f(r) \right) \times r^2$$

$$\frac{r^3}{T^2} = k' f(r)\, r^2 = \text{Const}$$

$$f(r) \propto \frac{1}{r^2}$$

$$\boxed{F_G = \frac{G M_A M_B}{r^2}}$$

$$\boxed{\vec{F}_{A-B} = -\frac{G M_A M_B}{r_{AB}^2} \hat{r}_{AB}}$$