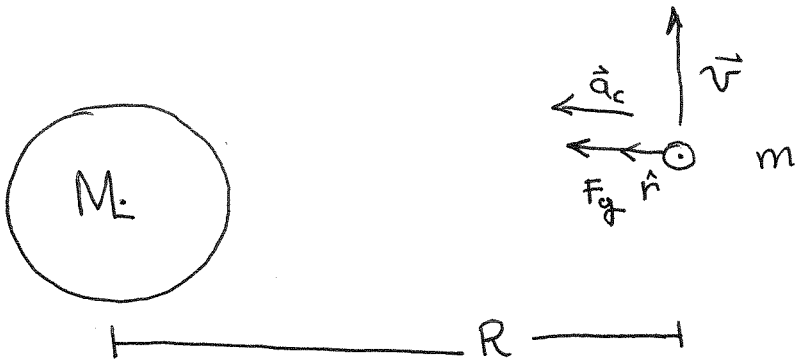
SATELLITES



$$|\vec{a}_c| = \frac{v^2}{R}$$

I $$\vec{F}_g = \frac{GMm}{R^2}\hat{r}$$

NEWTON'S LAW OF GRAVITATION

$$\vec{F}_g = m\frac{v^2}{R}\hat{r}$$ II

NEWTON'S SECOND LAW

I => II

$$\frac{GMm}{R^2} = ma_c = \frac{mv^2}{R}$$

$$v^2 = \frac{GM}{R}$$

$$v = \sqrt{\frac{GM}{R}}$$ III

$$\vec{F}_g = \frac{GMm}{R^2}\hat{r} \equiv m\vec{g}$$

$$\vec{g} = \frac{GM}{R^2}\hat{r}$$

$$g = \frac{GM}{R^2}$$

Kepler's Third Law

$$T = \frac{2\pi R}{v} \quad \text{IV} \qquad \text{III} \Rightarrow \text{IV} \Rightarrow$$

$$T = 2\pi R \sqrt{\frac{R}{GM}}$$

$$T = \frac{2\pi R^{3/2}}{\sqrt{GM}}$$

SCALE GRAVITATIONAL ACCELERATION $g \Rightarrow$

COMPARE g_2 to g_1 as a Ratio $\Rightarrow$

$$g = \frac{GM}{R^2} \qquad g_2 = \frac{GM_2}{R_2^2} \qquad g_1 = \frac{GM_1}{R_1^2}$$

$$\frac{g_2}{g_1} = \frac{GM_2}{R_2^2} \cdot \frac{R_1^2}{GM_1}$$

$$\frac{g_2}{g_1} = \frac{M_2}{M_2} \cdot \frac{R_1^2}{R_2^2}$$

COMPARE ORBITAL PERIODS

$$T = \frac{2\pi R^{3/2}}{\sqrt{GM}}$$

$$T_2 = \frac{2\pi R_2^{3/2}}{\sqrt{GM_2}} \qquad T_1 = \frac{2\pi R_1^{3/2}}{\sqrt{GM_1}}$$

$$\frac{T_2}{T_1} = \frac{2\pi R_2^{3/2}}{\sqrt{GM_2}} \cdot \frac{\sqrt{GM_1}}{2\pi R_1^{3/2}} = \frac{R_2^{3/2}}{R_1^{3/2}} \sqrt{\frac{M_1}{M_2}}$$

$$\frac{T_2}{T_1} = \left[\frac{R_2}{R_1}\right]^{3/2} \left[\frac{M_1}{M_2}\right]^{1/2}$$