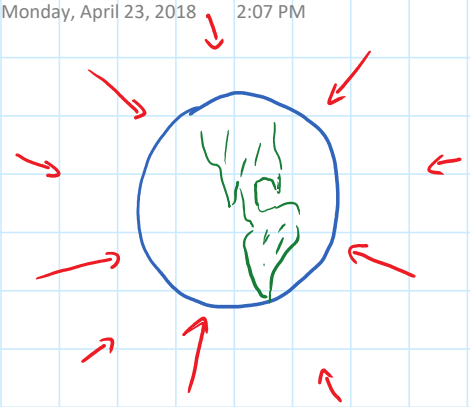
Gravitational Force & Orbital Motion

Monday, April 23, 2018 2:07 PM



- all mass have grav. field
- an attractive field
- $g = \frac{Gm}{r^2}$, acc due to gravity
  - r: from the center
  - units are N/kg

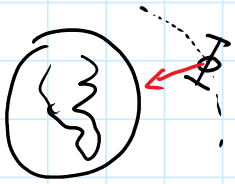
g.f.s. for the moon

$$g = \frac{\left(6.67\times10^{-11}\ \frac{N\,m^2}{kg}\right)\left(7.35\times10^{22}\ kg\right)}{\left(1.74\times10^{6}\ m\right)^2} = 1.63\ N/kg$$

$1.63\ m/s^2$

When a 2nd mass is placed in a grav. field there is a force exerted on each object.

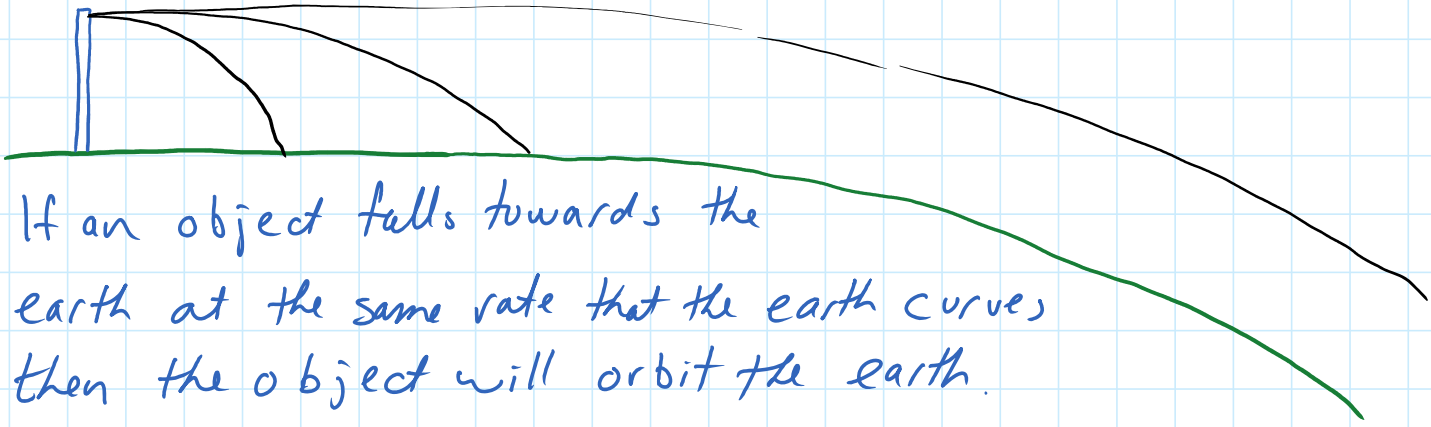
$$F_g = \frac{Gm_1m_2}{r^2}$$



$F_{net} = F_g$

$F_c = F_g$

Orbital Motion



If an object falls towards the earth at the same rate that the earth curves then the object will orbit the earth.

Orbit → circular $F_c = F_g$

$\frac{mv^2}{r} = \frac{Gm_1m_2}{r^2}$ $\qquad$ $m\frac{4\pi^2 r}{T^2} = \frac{Gm_1m_2}{r^2}$

$v^2 = \frac{Gm_e}{r}$ $\qquad$ $\frac{4\pi^2 r^3}{T^2} = Gm_1$, $T^2 = \frac{4\pi^2 r^3}{Gm}$