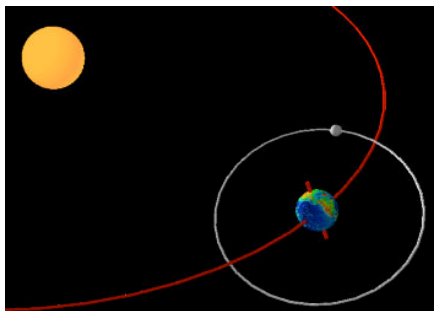


1



Unit 8 Gravitation

2

$$F_g = -\frac{GmM}{r^2}$$

$$G = 6.67 \times 10^{-11} \frac{Nm^2}{kg^2}$$

- What does negative sign mean?
- What does r stand for?

Newton's Law of Gravity

3

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

- What does M stand for?
- What does r stand for?
- What do you need to do if you are given the altitude above a planet's surface instead of the entire radius?

Calculating g [m/s²]

4

- Spherical Shell (Hollow)**
F = 0 everywhere inside
[insert pic]
- Solid Sphere**
Force inside = [FORMULA]
[insert pic]
- Outside both types of spheres, treat all mass as if located @ center

Solid+Hollow Spheres

5

$$\sum F_c = ma_c$$

$$\frac{GmM}{d^2} = \frac{mv^2}{r}$$

For satellite, d=r
[solve for v]

For binary stars, d = separation, r = dist from star's center to COM
[include COM formula]

Circular Motion

6

$$T = \frac{2\pi r}{v}$$

T = time in sec to complete on revolution

[Kepler's Law]

For satellite:
v = sqrt(GM/r)
[Derive formula below]

$$T^2 = \frac{4\pi^2 r^3}{GM}$$

Period Formulas

7

To be completed next week

Gravitational Potential Energy

8

Total Energy