Dynamics: Note 9

*Newton’s Universal Law of Gravitation*

So far, if we wanted to find the force of gravity on an object, all we needed to use was the equation Fg = mg.

But where does this come from? What happens if we wanted to find Fg between two planets that each have their own gravity? What happens if we anted to find Fg between two smaller objects? What if the objects are very far away from each other, where acceleration due to gravity is lower than 9.81m/s2?

We need to use the general formula for Fg for any of the cases listed above:

*Fg* 

*Gm*1*m*2 *r*2

Where:

-Fg is the force of gravity measured in Newtons (N)

-m is the mass of an object in kg

-r is the distance between the centers of the objects in m

-G is the Gravitational Constant, equal to 6.67x10-11 Nm2/kg2

Unit Analysis:

Eg. Alice and Bob are sitting beside each other. Alice has a weight of 565N and Bob has a mass of 75kg. If they are 0.225m apart, what force of gravity do they feel between each other?

To see if this equation is connected to Fg = mg, all we need to remember is the mass and radius of the earth: (me = 5.98x1024kg, re = 6.38x106m)

May people are afraid of 2012. One theory is that on Dec 21, Earth will be in alignment with our sun and the black hole in the middle of the Milky Way, and we will be sucked into it on that day. Use the formula to see if this is true:

ms = 1.99x1030 kg

mbh = 2.6 million x ms

rmw = 52850 ly \* 9,460,730,472,580.8 km

reorbit= 1.5x1011m