Physics, Preparation for Friday, Dec. 8

Read *Six Ideas* N11

Kepler's Laws.

Physics Lunches

Thursdays are physics lunches. *I am very happy to do additional physics lunches any day except Monday (when I have LibCom over lunch).*

For Problem Set 12

1. Rebecca and Emma presented N10M.12, p. 168. This problem is a continuation of their work.

(i) In step (g), they found A by adding and squaring the equations and taking the square root. Find θ by dividing the equations. You'll get a nice equation for $\tan\theta$.

(j) Now that you have formulae for both A and θ, you can graph the solution! Assume $L = \sqrt{3}\ \Delta L$ and $\Delta L = 1$ m. Also assume :

$\omega = \sqrt{\frac{k_s}{m}} = \frac{5}{3}\frac{\pi}{\text{s}}$ (which is equivalent to the period $T = \frac{2\pi}{\omega} = 1.2$ s)

Graph the fraction of a second for which the system obeys simple harmonic motion and make your graph accurate enough to show what happens at 0.1s intervals.

(k) Repeat (j), but with $L = \Delta L \,/\, \sqrt{3}$ (and the same ΔL and ω).

2. N11B.11, p. 186, the period of a space probe in an elliptical orbit

3. N11M.3, p. 186. COMPARING gravitational strengths means take the ratio not the difference. Do it in symbols and clean up as much as possible before plugging in the distance to the Moon, the distance to the Sun, the mass of the Moon, and the mass of the Sun. G is not needed!

4. N11M.7, p. 186, this is close to the heart of Newton's brilliant argument that the Laws of Physics are Universal.

5. N11D.2, p. 187, Kepler's Third Law in a bizarre world where gravity falls off as $\frac{1}{r^3}$. If we lived in one more dimension, this is what gravity would do.