Topics 8-12 Study Guide

I. Things to memorize. On the test you will be given a blank space where you will be asked to reproduce the following information from memory.

A. Equations
- Impluse and Momentum: $\vec{I} = \int \vec{F} dt$, $\vec{p} = m\vec{v}$, $\vec{I} = \Delta \vec{p}$
- Centripetal acceleration: $a_c = \frac{v^2}{r}$
- Constant α rotations: $\omega_f = \omega_i + \alpha t$, $\Delta\theta = \omega_i t + \frac{1}{2}\alpha t^2$
- Moment of Inertia: $I = \Sigma m r^2$
- Rotational Kinetic Energy: $KE_R = \frac{1}{2}I\omega^2$
- Torque: $\mathcal{T} = rF_\perp = I\alpha$
- Angular Momentum: $L = rp_\perp = I\omega$
- Universal Gravitation: $F_g = G\frac{m_1 m_2}{r^2}$

B. Units:
- $[I] = [p] = kg \cdot m/s$ (where I is impluse)
- $[\theta] = rad$, $[\omega] = rad/s$, $[\alpha] = rad/s^2$
- $[I] = kg \cdot m^2$ (where I is moment of inertia)
- $[\mathcal{T}] = N \cdot m$
- $[L] = kg \cdot m^2/s$

II. Proofs:
- Derive the ideal banking angle formula.
- Show that $x = R\theta$, $v = R\omega$, and $a = R\alpha$.
- Show that the condition necessary for circular orbits is $v^2 = GM/r$.

III. Problem solving. There will be a few questions directly from the HW and a few original questions.