Physics 151 Reading Assignment for July 15
Sections 7.4 through 7.6, 9.7, 10.3

Please notice that this file is two pages long.

7.4 - Rotational Dynamics and Moment of Inertia

- Newton's Second Law for rotation starts with the fact that torques cause angular acceleration.
- Moment of Inertia, I - The rotational counterpart to mass. It tells us how "hard" it is to rotate something.
- $\tau_{net} = I\alpha \Rightarrow$ the bigger the moment of inertia the more torque needed to rotate an object.
- For common shapes, use the table on page 216 to determine the moment of inertia.

7.5 - Using Newton's Second Law for Rotation

- I'm not going to stress this too much in lecture since we already have most of the skills needed to solve these problems.
- Examples 7.11 and 7.12 are the best ones to look over in this section since they will be most like what we'll see on homework.

7.6 - Rolling Motion

- We'll combine this section and the one from chapter 10 on kinetic energy.
- Figure 7.35 is really good at visually explaining where the "rolling constraint" $v = \omega r$ comes from.

- A wheel which rolls without slipping has a total velocity of zero at the point where it touches the ground. This is why we have static friction between a wheel and the road.

9.7 - Angular Momentum

- We're tying up a few loose ends here.
- Angular momentum, L, is the rotational counterpart to linear momentum. $\tau_{av} = \frac{\Delta L}{\Delta t}$ in the same way that $F_{av} = \frac{\Delta p}{\Delta t}$.
- Angular momentum for systems and *for single objects* is conserved if we ignore external torques.

10.3 - Kinetic Energy

- Here you just need to read the part about the kinetic energy of a rotating and rolling object.
- Rotating object, $K = \frac{1}{2}I\omega^2$.
- Rolling object, $K = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$ - rolling objects have more kinetic energy!
- If an object rolls without slipping, we can write $K = \frac{1}{2}mv^2\left(1 + \frac{I}{mR^2}\right)$.