Physics 151 Reading Assignment for July 10 Sections 10.5 through 10.8, 7.1 through 7.3, 8.1 and 8.2

Please notice that this file is three pages long!

10.5 - Thermal Energy

- The work done by friction is changed into thermal energy, *i.e.*, heat.
- I tend to ask students to solve for the work done by friction, W_f, but it's a good idea to realize that $W_f = -\Delta E_{th}$ can also be used.

10.7 - Energy in Collision

- I won't have time to go over this in lecture, but it's a straightforward application of the last two chapters.
- Please be aware that when objects collide, the total momentum of the system will always be conserved. The total kinetic energy of the colliding objects may or may not be conserved. It depends on whether heat is created during the collision. If in doubt use momentum.

10.8 - Power

- Power - The rate at which work is done or the rate at which energy is transformed.
- Unit of power - $J/s = Watt$.

7.1 - The Rotation of a Rigid Body

- Rigid body - "big" object that doesn't change shape when rotating.
- Every point on a rotating rigid body has the same angular velocity, ω.
- Angular acceleration, α - the rate at which angular velocity changes.
- Graphs for Rotational Motion - A nice reminder of chapter 2, but we probably won't have time to do this in class.
- Every point on a rotating rigid body has two linear accelerations - the centripetal and tangential accelerations.
- Centripetal acceleration - we've studied already. Points toward the center. $a_c = \frac{v^2}{r} = \omega^2 r$. Due to changes in direction.
- Tangential acceleration - in the same direction as the linear velocity, $\vec{\mathbf{v}}$ (and so at 90° to $\vec{\mathbf{a}}_c$). Due to changes in speed. $a_t = \alpha r$.

7.2 - Torque

- Torque - How "effective" a force is at causing rotation.
- Unit $N \cdot m$ - which we do not call a Joule to keep torque separate from energy.
- Only the component of the force perpendicular to the radial line causes torque
- The perpendicular distance is useful for vertical or horizontal forces, but otherwise, it's probably best to stick with $\tau = rF \sin\phi$.
- To find the net torque we have to figure out whether the torque is trying to cause counter-clockwise or clockwise rotation. As is usual, counter-clockwise is made positive in the standard convention.

7.3 - Gravitational Torque and the Center of Gravity

- Center of Gravity - the point where the entirety of the weight seems to act.

- Gravitational torque is one problem where I will expect you to use perpendicular distance.
- For symmetric objects with a uniform density, the center of gravity is located at the center.
- Finding the center of gravity for non-symmetric objects is something I don't require students to do. You should read this rest of this section for your own interest.

8.1 - Torque and Static Equilibrium

- This section combines what we know about linear and rotational motion.
- When an object is at rest $\sum \overrightarrow{\mathbf{F}} = 0$, but it's also not rotating, so $\sum \tau = 0$.
- A very useful fact in problem solving is that we can choose *any* point on the object to be O and the $\sum \tau = 0$.

8.2 - Stability and Balance

- When trying to balance an object on a point, if its center of gravity is directly above the balancing point it will be stable.