Fundamentals of Physics: Problem Set #3

Momentum and Energy Conservation

$$\vec{p} = m\vec{v} \;\; ; \;\; \vec{p}_{total}^{\,before} = \vec{p}_{total}^{\,after} \;\; ; \;\; \vec{F} = \frac{[d\vec{p}]}{dt}$$

$$\vec{L} = I\vec{\omega} \;\; ; \;\; I = \sum m_i r_i^2 = \alpha MR^2 \;\; ; \;\; \vec{L}_{initial} = \vec{L}_{final} \;\; ; \;\; \vec{\tau} = \frac{[d\vec{L}]}{dt}$$

$$E_{total} = K_{total} + V_{total} \;\; ; \;\; K = \frac{1}{2}m|\vec{v}|^2 \;\; ; \;\; V_{gravity}(r) = -G\frac{m_1 m_2}{r} \;\; ; \; V_{gravity}(z) \approx mgz \text{ (near earth surface)}$$

Notes: No Lab this week since Campus Day is Thursday. Also, please try to attend the "Celebration of Research" poster session Tuesday 11:30-1:00 in the KC.

Due: Friday Sept. 13 in class

Reading assignment: for Monday, C6 (Conservation of Angular Momentum)
for Wednesday, C8 (Conservation of Energy)
for Friday, C9 (Potential Energy Functions)

Problem assignment:

(WARNING - The problem numbering scheme in the text can be a bit confusing, so ALWAYS double check the problem numbers to make sure you don't work the wrong problems!)

C5-B.9 (cart collision)
C5-M.3 (bowling ball collision)
C5-R.1 (Starbase-Alpha in trouble)

C6-B.3 (basketball physics)
C6-M.6 (playground physics)
C6-R.1 (poolside physics)

C8-B.7 (cliff diving ... how high is safe?)
C8-M.1 (impact speed of a dropped penny)
C8-M.6 (launching cargo from the moon)

Bonus: C8-R.1 (can YOU jump off an asteroid? ... do C8-B.4 to find your jump speed)