Principles of Physics: Problem Set #5

Forces and Motion [& some energy conservation]

$$\vec{F}_{total} = \sum \vec{F} = M\vec{a} \;\; ; \;\; \sum F_x = Ma_x \;\; ; \;\; \sum F_y = Ma_y \;\; ; \;\; F_f = \mu F_n$$

$$\text{for } \vec{a} = \text{constant}: \quad v = v_o + at, \quad x = x_o + v_o t + \frac{1}{2}at^2$$

$$K = \frac{1}{2}Mv^2 \;\; ; \;\; P = Mgy \;\; ; \;\; E_{tot} = K + P \;\; ; \;\; E_{\text{initial}} = E_{\text{final}}$$

Due: Friday Sept. 28 in class

Note: This week's lab is on energy conservation (we will talk about this topic in class on Monday). You will write a paper describing this experiment that is due on Monday, Oct. 8. Instructions for this assignment are given in your lab manual. (We will have an "open" lab the week of Oct. 1-5).

Reading assignment:

for Mon,	Ch 6 (pp 108-109)	[Intro to conservation of energy]
	Ch 4 (pp 62-67)	[Force diagrams and vector components]
for Wed,	Ch 4 (pp 67-70)	[Friction forces: static and sliding]
for Fri,	Ch 4 (pg 71)	[Coupled systems and internal forces]

Problem assignment:

(WARNING - The problem naming/numbering scheme in the text is confusing, so ALWAYS double check whether a problem is guided review (**GR**), skill building (**SB**), **Synthesis**, etc.)

CHAPTER 4

GR-8 (pg 83 ... rope pulling a box I)

GR-10 (pg 83 ... rope pulling a box II ... careful, $F_f \neq 32$N here because $F_n \neq F_g$)

GR-14 (pg 83 ... toboggan on a hill ... also calculate the coefficient of friction μ)

SB-6 (pg 85 ... rope pulling another box)

SB-7 (pg 85 ... forces on a rocket)

SB-8 (pg 85 ... adding force vectors)

MC-2, 3, 5 (pg 88-89 ... multiple choice for force diagrams and vectors)

A1. You throw a ball straight up with initial speed 12.0 m/s from an initial height of 1.0 m. Determine the maximum height that the ball will rise above the ground using:

a) Constant acceleration equations of motion

b) Conservation of mechanical energy