VCP Week 4 Assignment

Phil Voglewede
Marquette University

November 17, 2012

**Idea to Improve Class Climate**

In class, I will focus on making sure that the students understand that there is more than one right answer to problems. I will ask questions in lecture which I know have multiple correct answers depending upon how one approaches the problem. We will discuss these approaches during the class.

**Ideas for Conceptual Questions for Dynamics**

1. (Mass moment of inertia): Three objects (a sphere, a hoop, and a cylinder) of the same radius and same mass are placed on a ramp. If all are left to roll to the bottom of the ramp, which one reaches the bottom first?
2. (Tension in cords): A box on a cord goes over a pulley to a person releasing it at a constant rate. Is the tension in the cord is equal to the weight of the box, less than the weight of the box, or more than the weight of the box?
3. (Tangential velocity and independence of motion): When trying to hit a mailbox at the same height with a water balloon while driving by in a car, at what point and with what direction should the person release the water balloon: at the mailbox, straight out; at the mailbox, slightly upward; before the mailbox, straight out; before the mailbox, slightly upward?
4. (Conservation of energy; Conservation of angular momentum): An ice skater pulls her arms in to increase her angular velocity. Leo states that angular momentum is conserved. Thus, her angular speed increases via the equation:

$$I_1\omega_1 = I_2\omega_2$$

Carl states that energy is conserved. Thus, her angular speed increases via the equation:

$$\frac{1}{2}I_1\omega_1^2 = \frac{1}{2}I_2\omega_2^2$$

Who is correct? Leo, Carl, both, or neither?

5. A uniform thin disk A is rigidly connected to a massless rod BC in Case 1 and two massless cords in Case 2 as shown. In both cases, A is released from rest at an angle $\theta = \theta_0$. When $\theta = 0$, which system will have a larger velocity of the center of mass of A?