## Chapter C8: Force and Energy Practice

## Physics I

## College of the Atlantic

- 1. You want a spring that is capable of launching a full Nalgene bottle around 1 meter into the air if the spring is compressed by 5 cm. What must the spring constant be for such a spring?
- 2. Consider two displacement vectors:  $\vec{v_1} = [3m, -4m]$  and  $\vec{v_2} = [2m, -2m]$ . Calculate  $\vec{v_1} \cdot \vec{v_2}$ . Calculate the angle between  $\vec{v_1}$  and  $\vec{v_2}$ .
- 3. A 0.5 kg TAB mug is traveling due north at 10 m/s.
  - (a) The object is briefly acted upon by a force of 2 Newtons due east.
  - (b) The object is briefly acted upon by a force of 2 Newtons due south.
  - (c) The object is briefly acted upon by a force of 2 Newtons 37 degrees west of north.

In each instance, the force acts on the mug for 1 second. For each force:

- (a) What is the impulse delivered to the mug?
- (b) What is the magnitude of the impulse delivered to the mug?
- (c) What is the k-work given to the mug? I.e., what is its change in kinetic energy?
- 4. A 1000 kg car rolls down a 37 degree incline at a constant speed of 20 m/s.
  - (a) In one second, what energy transfer does the gravitational interaction give to the car?
  - (b) Where does this energy transfer go?
  - (c) What is the change in the gravitational potential energy of the cart in one second?
- 5. A car goes over the crest of a hill at 20 m/s. The car then coasts to the bottom of the hill, 50 meters below. Ignoring friction, what is the car's speed at the bottom?