Name _____

***PLEASE* READ THIS FIRST**: Work the problems on separate sheets of paper and staple *this* sheet to the front. Read each problem *carefully* and be sure to pay attention to any hints that are provided. The credit you receive on each problem will depend at *least* as much on how you get your answer as on what answer you get. There is *no* need to be as "wordy" as I ask you to be on homework, but you must show your work or give *at least* a brief explanation for *every* answer. I give *no* credit for unsupported answers. I do give partial credit for partially correct solutions, but *only* when I can determine that what you are doing is partially correct. Make *certain* that all numerical answers are given with a reasonable number of significant digits (when in doubt, three is usually a good compromise) and that you have included *appropriate* and *simplified* units. Check your answers for physical *reasonableness* whenever possible; I do deduct a small number of points for ridiculous answers that go uncommented upon. You may use $g = 10.0$ m/s^2 in all problems to make the arithmetic a *little* easier.

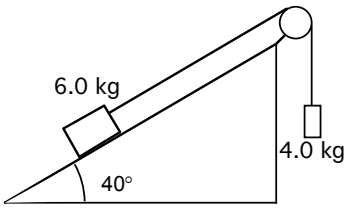
1. [20 pts] A car moving along a straight road at 32 m/s (about 72 mph) runs out of gas and begins to slow down at a constant rate. After coasting for 260 m, its speed is reduced to 20 m/s. What is the *magnitude of its acceleration*?

   [EXTRA CREDIT 5 pts] How much farther will it coast until it comes to a stop?

2. [20 pts] A not very good golfer manages to get the ball into the cup with three strokes. The first stroke sends the ball 150 yards due north. The second sends it 120 yards in a direction 30° south of west. The final stroke sends the ball 30 yards due east. A much better golfer manages to make a "hole in one," getting the ball into the cup from the same starting place in a single stroke. What is the *magnitude and direction of the ball's displacement* in that single stroke?

3. [20 pts total] A vandal throws a raw egg against the wall of a building that is 12 meters away. It leaves her hand with a speed of 20 m/s and hits the wall 0.80 seconds later.
   a) [10 pts] At what *angle above the horizontal* did she throw the egg. [Hint: Find the *x*-component of the egg's initial velocity.]
   b) [10 pts] How *high* up on the wall (above the point of release) does the egg hit? [Reminder: Use $g = 10.0$ m/s^2 to make the arithmetic easier.]

4. [20 pts total] A 6.0 kg block on a 40° incline is attached by a fine string over a light, well-lubricated pulley to a hanging 4.0 kg block as shown at right. The hanging block is moving downward, but it is slowing at a rate of 1.0 m/s every second.

   a) [10 pts] Find the *tension* in the string. [Hint: Consider only the hanging block. Another reminder: Use $g = 10.0$ m/s^2 to make the arithmetic easier.]
   b) [10 pts] Find the *kinetic coefficient of friction* between the 6.0 kg block and the incline.

   [EXTRA CREDIT 5 pts] What value for the kinetic coefficient of friction would reduce the magnitude of the acceleration to zero?

5. [10 pts] A new car is advertised as having a "spectacular fuel efficiency of 100,000 rods per hogshead!" Given that there are 2 hogsheads in a butt (no kidding!), that a butt is equal to 126 gallons, that a rod is 16.5 feet and, that there are 5280 feet in a mile, do a calculation that will allow you to determine whether or not the ad is being honest.

6. [10 pts] A peanut butter sandwich with a mass of 400 g moves to the right. Its motion can be described by the following equation giving its position (x) as a function of time (t): $x = A\left(1 - e^{-bt}\right)$ where $A = 40$ m and $b = 0.40$ s^{-1}. What is the *net force* (a vector) acting on the sandwich when $t = 3.0$ s? [Huge hint: What is its acceleration?]