PHYS 1114 -- College Physics I
Sample Exam 3

Potentially useful equations: $\vec{F} = m\vec{a}$

You will be responsible for knowing the kinematic equations by now:

$$v_f = v_i + a(\Delta t) \qquad x_f = x_i + v_i(\Delta t) + \frac{1}{2}a(\Delta t)^2 \qquad v_f^2 = v_i^2 + 2a(\Delta x)$$

You will still need to know the acceleration due to gravity near the surface of the earth ($g = 9.8$ m/s^2). You will need to know the experimental relationship between the frictional force and the normal force: $F_f = \mu F_N$

(Answers will be posted on the web at cimms.ou.edu/~mansell/phys1114)

Problem 1: Find the force (F_3) that balances these two forces (i.e., so that F_{net}=0):

F_1 is 20 N at 60° above the +x axis

F_2 is 25 N pointing 20° below the +x axis

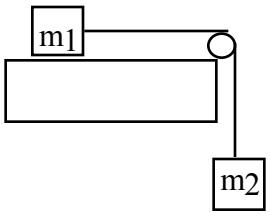
(First change both vectors into component form.)

Problem 2: What is the weight (in lbs) of a 15 kg dog at the surface of the earth? (1 N = 0.225 lb). What is the mass (in kg) of a 640 N person?

Problem 3: (a) A 10-kg block is sitting on a slab of ice (an ice rink). If the coefficient of static friction is 0.1, what horizontal force is necessary to get the block to start moving? (b) If the coefficient of kinetic friction is 0.02, what force is needed to keep the block moving at constant velocity?

Problem 4: State Newton's 3 Laws, in words using complete sentences. (You may also use equations, if appropriate.) (15 pt)

Problem 5: For the blocks in the figure, m_1=10 kg and m_2=5kg. If there is no friction (and the rope has negligible mass and does not stretch), what is the acceleration of the blocks? Draw a free body diagram for each block and apply the 2nd law to each. What is the tension in the rope?



Problem 6: What net force is necessary to accelerate a 700-kg automobile from 0 to 40 m/s in 8 s?

Problem 7: An 80-kg person is standing on a scale in an elevator. What does the scale read (in Newtons) when the elevator is (a) at rest. (b) moving upward at constant velocity, (c) moving down at constant velocity (d) accelerating upward at 1.5 m/s^2 (e) accelerating downward at -0.5 m/s^2 (f) the cable breaks and the elevator goes into free fall (a = g downward)?