PHYSICS 1030
Homework #4

(Due Oct. 11, 2016)

1. (Serway 5-3) A 3.00-kg object undergoes an acceleration given by $\mathbf{a} = (2.00\,\mathbf{i} + 5.00\,\mathbf{j})$ m/s^2. Find (a) the resultant force acting on the object and (b) and the magnitude of the resultant force.

2. (Serway 5-18) A force $\mathbf{F}$ applied to an object of mass m_1 produces an acceleration of 3.00 m/s^2. The same force applied to a second object of mass m_2 produces an acceleration of 1.00 m/s^2. (a) What is the value of the ratio m_1/m_2? (b) If m_1 and m_2 are combined into one object, find its acceleration under the action of the force $\mathbf{F}$.

3. (Serway 5-30) A block slides down a frictionless plane having an inclination of $\theta = 15.0°$. The block starts from rest at the top, and the length of the incline is 2.00 m. (a) Draw a free-body diagram of the block. Find (b) the acceleration of the block and (c) its speed when it reaches the bottom of the incline.

4. A body of mass 15 kg rests on a frictionless horizontal plane and is acted on by a horizontal force of 30 newtons. (a) What acceleration is produced? (b) How far will the body travel in 10 seconds? (c) What will be its velocity at the end of 10 seconds?

5. A balloon is descending with a constant acceleration a, less than the acceleration due to gravity g. The weight of the balloon, with its basket and contents, is w. What weight, W, of ballast should be released so that the balloon will begin to be accelerated upward with constant acceleration a? Neglect air resistance.