PAL Problem Set 8 for Phys 5A (Forces and Newton's Laws I)

Always explain your answers and show your work.

1. A bucket of water that is attached to a rope in the situations below. For each situation:

   - Draw a free-body diagram for the bucket paying attention to the relative length of the forces. Label every force in your FBD.
   - Draw (on the side) a vector representing the net force on the bucket, or say $\vec{F}_{net} = 0$.
   - Draw (on the side) a vector representing the acceleration on the bucket, or say $\vec{a} = 0$.

   A. The bucket is moving down with constant speed.
   B. The bucket is moving up with constant speed.
   C. The bucket is moving up and speeding up.
   D. The bucket is moving up and slowing down.

2. If you know all of the forces acting on a moving object, can you tell in which direction the object is moving? If the answer is Yes, explain how. If the answer is No, give an example.

3. Give an example of the motion of an object in which the frictional force on the object is directed opposite to the motion.

4. Give an example of the motion of an object in which the frictional force on the object is in the same direction as the motion.

5. Becca and Linus are about to sit down to watch TV with their parents. They reach for the last blanket in the living room and grab it at the same time. Becca, whose mass is 48 kg, pulls the blanket to the right with a 25 N force and Linus, whose mass is 60 kg, pulls the blanket with a force of 20 N to the left. Assume that the blanket has mass of 900 g and ignore all other forces on the blanket (such as its weight). At this instant, what is the acceleration (magnitude and direction) of the blanket?

6. A toy cart of mass 400 g is experiencing a constant net force of $-2\,N$ (i.e., pointing in the negative x-direction). Draw velocity versus time and position versus time graphs for the first 4 seconds of the motion. Assume that the toy cart is at $x_i = 0$ and at rest at $t = 0$.