PAL Problem Set 9 for Phys 5A (Forces and Newton's Laws II)

Always explain your answers and show your work.

1. 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.

2. If you are trying to get ketchup out of the bottle, the best way to do it is to turn the bottle upside down and give the bottle a sharp upward smack, forcing the bottle rapidly upward. Use the physics terms inertia, force, net force, and acceleration to clearly explain why this method works.

3. Clara is a little toddler. She is sitting on her little bed. Draw Clara's free-body diagram. Identify the Newton's third law pair corresponding to each force acting on Clara.

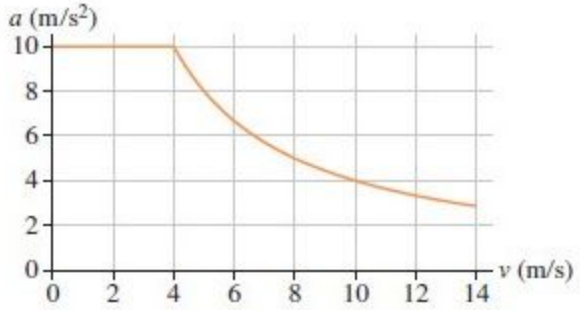
4. An elevator, suspended by a single cable, has just left the tenth floor and is speeding up as it descends toward the ground floor.

    A. Draw a motion diagram for this situation.
    B. Draw a free-body diagram for this situation.

5. A bag of groceries is on the back seat of your car as you stop for a stop light. The bag does not slide. Friction cannot be ignored.

    A. Draw a motion diagram for this situation.
    B. Draw a free-body diagram for this situation. What kind of friction force is acting on the bag of groceries? How can you tell?

6. Researchers have measured the acceleration of racing greyhounds as a function of their speed; a simplified version of their results is shown in the graph. The acceleration at low speeds is constant and is limited by the fact that any greater acceleration would result in the dog pitching forward because of the force acting on its hind legs during its power stroke. At higher speeds, the dog's acceleration is limited by the maximum power its muscles can provide.



    A. What is the agent of the force that causes the dog to accelerate?

    B. If the dog's mass is 36 kg, what is the average force acting on it during its initial acceleration phase?

    C. How far does the dog run until its speed reaches 4.0 m/s?