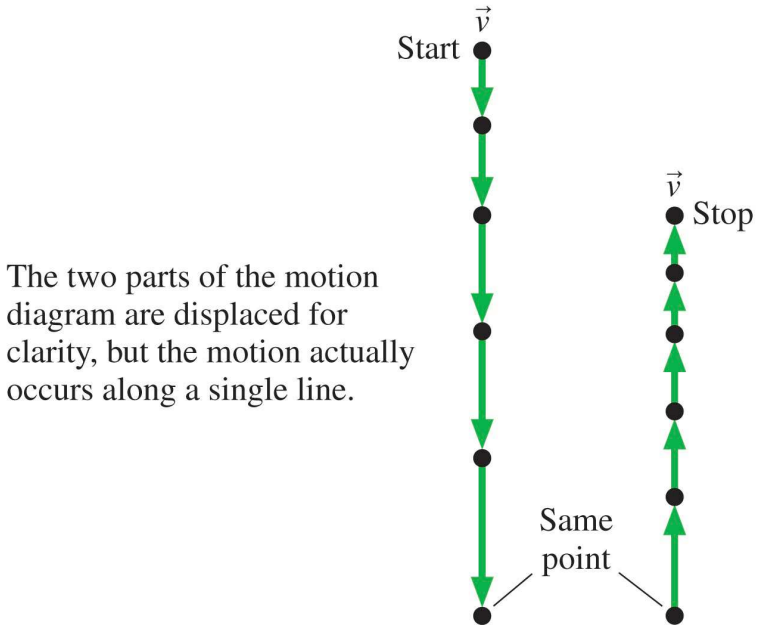
Physics 151
Homework Assignment #1
Due June 6

#1 A ball rolls along a smooth horizontal floor at $10\,m/s$, starts up a 20° ramp, stops after some distance, and then rolls back down. Draw the motion diagram showing the ball's velocity vectors from its initial position until it begins to roll back down the ramp.

#2 For the motion diagram shown, write a one or two sentence "story" about a *real object* that has this motion. Your story should talk about people or objects by name and say what they are doing. Problems 34 through 40 in chapter 1 of the textbook are examples of motion short stories.



#3 Shannon decides to check the accuracy of her speedometer. She adjusts her speed to read exactly $60\,mph$ on her speedometer and holds this steady, measuring the time between successive mile markers separated by exactly $1.00\,mi$. If she measures a time of $54\,s$, is her speedometer accurate? If not, is the speed it shows too high or two low?

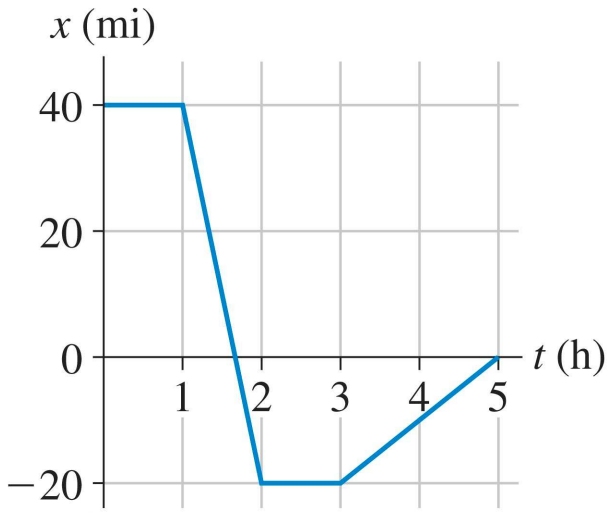
#4 The bacterium *Escherichia coil* (or *E. coli*) is a single-celled organism that lives in the gut of healthy humans and animals. Its body shape can be modeled as a 3-μm-long cylinder with a $1.5\,\mu m$ diameter. The bacterium moves at a constant speed of $30\,\mu m/s$, though not always in the same direction. Answer the following questions about *E. coli* giving your answers to the correct number of significant figures.

(a.) What is its length in meters?

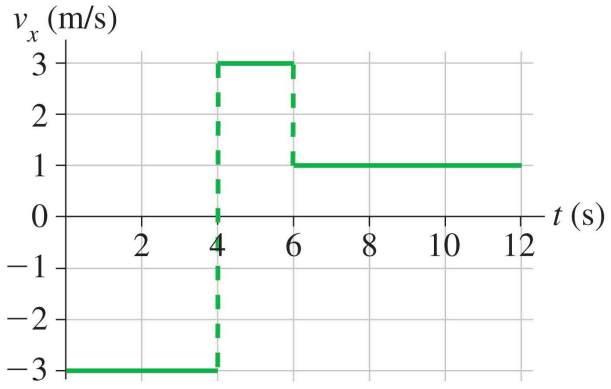
(b.) What is its volume in cubic meters?

(c.) If *E. coli* were to move along in a straight line, how many meters would it travel in one day?

#5 Write a short description of the motion of a real object for which the figure P2.4 would be a realistic position-versus-time graph.



#6 For the velocity-versus-time graph shown:

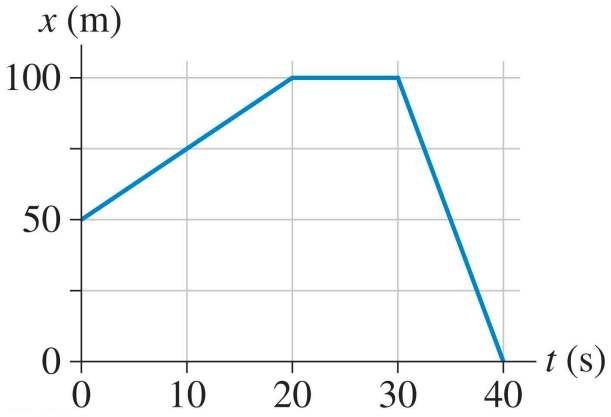


(a.) Draw the corresponding position-versus-time graph. Assume that $x = 0\,m$ at $t = 0\,s$. (Your graph must have the correct position values on it for full points.)

(b.) what is the object's position at $t = 12\,s$?

(c.) Describe a moving object that could have these graphs.

#7 A bicyclist has the position-versus-time graph shown in the figure. What is the bicyclist's velocity at the following times?

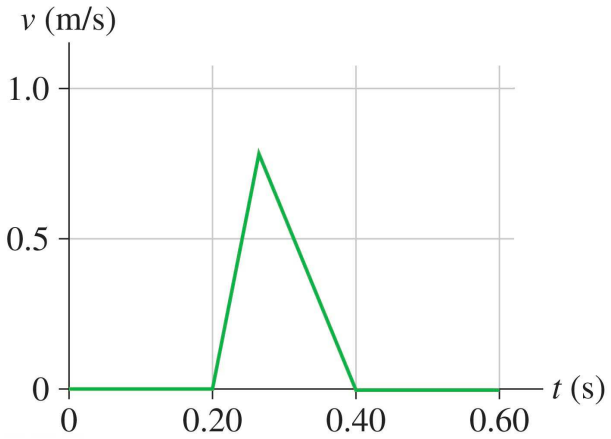


(a.) $t = 5\,s$?

(b.) $t = 22.5\,s$?

(c.) $t = 38\,s$?

#8 A somewhat idealized graph of the speed of the blood in the ascending aorta during one beat of the heart is shown in the figure.



(a.) Approximately how far, in *cm*, does the blood move during one beat?

(b.) Assume the same graph is valid for the motion of the blood in your body. Estimate how many beats of your heart it will take for the blood to get from your heart to your brain.

#9 A truck driver has a shipment of apples to deliver to a destination 500 miles away. The trip usually takes him 10 hours. Today he finds himself daydreaming and realizes 150 miles into his trip that he is running 20 minutes later than his usual pace at this point. At what speed must he rive for the remainder of the trip to complete it in the usual amount of time?