

Name _____ Date _____ Partners _____

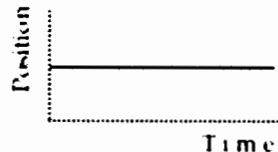
HOMEWORK FOR LAB 1: INTRODUCTION TO MOTION

Position-Time Graphs

Answer the following questions in the spaces provided.

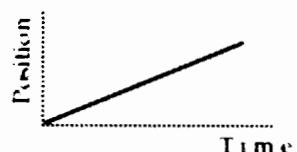
1. What do you do to create a horizontal line on a position-time graph?

stay still.



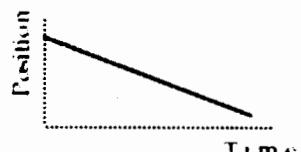
2. How do you walk to create a straight line that slopes up?

walk in the +ve dir.
at constant velocity.



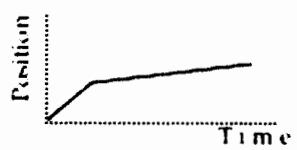
3. How do you walk to create a straight line that slopes down?

walk in the -ve dir.
at constant velocity.



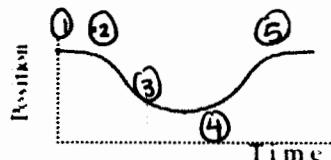
4. How do you move so the graph goes up steeply at first, and then continues up gradually?

walk in the +ve dir. first
at high velocity, then at low
velocity.



5. How do you walk to create a U-shaped graph?

(1) stay still



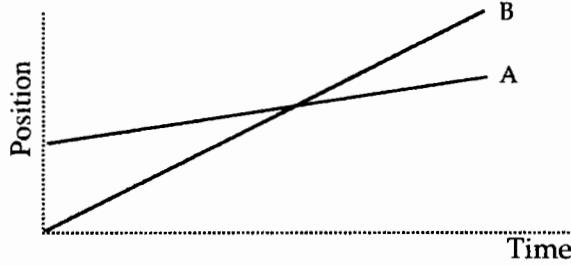
(2) walk towards origin at increasing
speed

(3) slow down and turn direction

(4) speed up away from origin

(5) slow down until you reach the original position
and stay still there

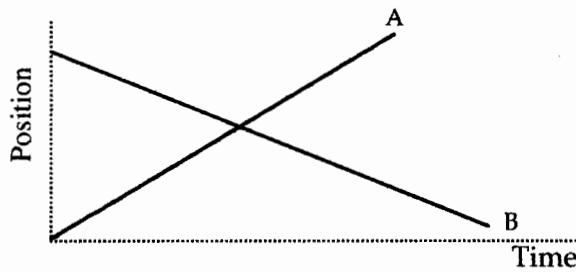
Answer the following about two objects, A and B, whose motion produced the following position-time graphs.



6. a) Which object is moving faster--A or B?
B

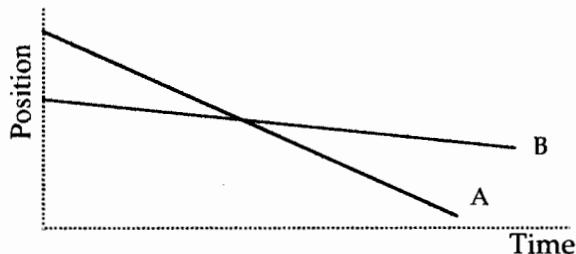
b) Which starts ahead?
Define what you mean by "ahead." *since they are travelling away from the origin, ahead means larger x (position).*
A starts ahead.

c) What does the intersection mean?
the cars are at the same position at that given time.



7. a) Which object is moving faster?
A

b) Which object has a negative velocity according to the convention we have established?
B.

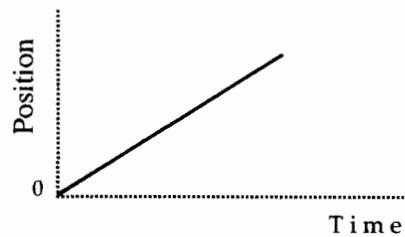


8. a) Which object is moving faster?
A

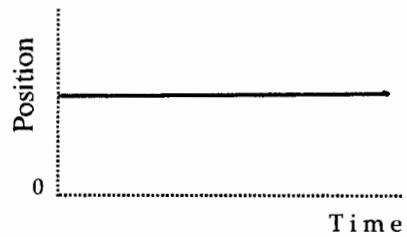
b) Which starts ahead?
Explain what you mean by "ahead."
if ahead means closer to the origin (since they are both moving there) then B is ahead.

Sketch the position-time graph corresponding to each of the following descriptions of the motion of an object.

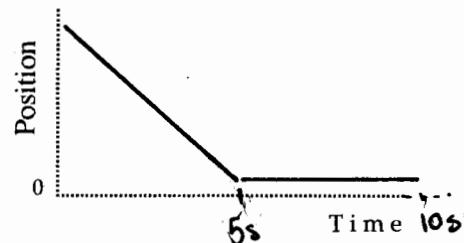
9. The object moves with a steady (constant) velocity away from the origin.



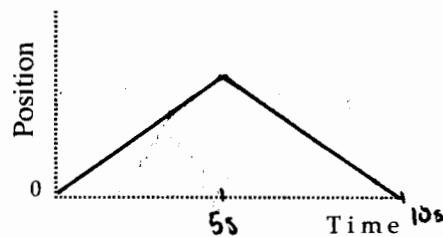
10. The object is standing still.



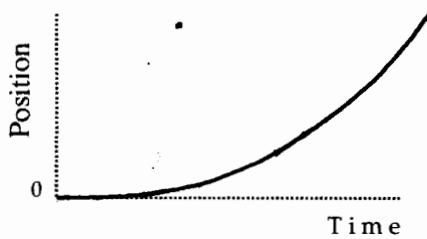
11. The object moves with a steady (constant) velocity toward the origin for 5 seconds and then stands still for 5 seconds.



12. The object moves with a steady velocity away from the origin for 5 seconds, then reverses direction and moves at the same speed toward the origin for 5 seconds.

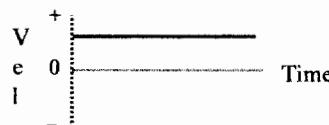


13. The object moves away from the origin, starting slowly and speeding up.



Velocity-Time Graphs

After studying the velocity-time graphs you have made, answer the following questions:



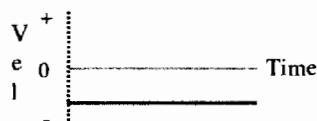
1. How do you move to create a horizontal line in the positive part of a velocity-time graph, as shown above? *move at const. speed in the same dir.*



2. How do you move to create a straight-line velocity-time graph that slopes up from zero, as shown above? *constant acceleration in the +ve dir, starting w/ zero velocity*



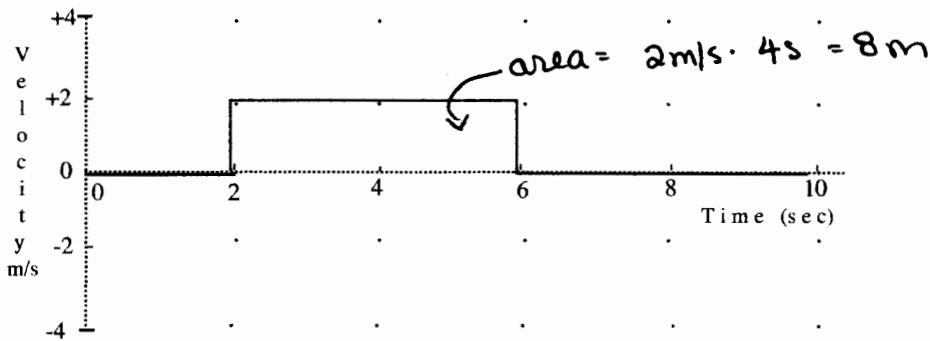
3. How do you move to create a straight-line velocity-time graph that slopes down, as shown above? *moves away from origin w/ constant deceleration, slowly down to zero velocity.*



4. How do you move to make a horizontal line in the negative part of a velocity-time graph, as shown above? *move in the -ve dir at constant speed.*

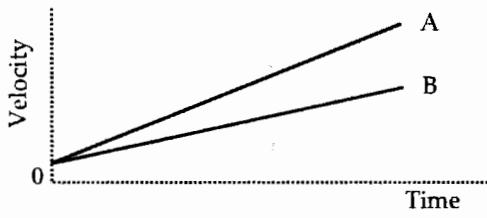
5. The velocity-time graph of an object is shown below. Figure out the total change in position (*displacement*) of the object. Show your work.

Displacement = 8 meters.



6. Both of the *velocity* graphs below, 1 and 2, show the motion of two objects, A and B. Answer the following questions separately for 1 and for 2. Explain your answers when necessary.

Graph 1



a) Is one faster than the other? If so, which one is faster? (A or B)

Yes A's faster

b) What does the intersection mean?

same velocity at $t=0$

c) Can one tell which object is "ahead"? (define "ahead")

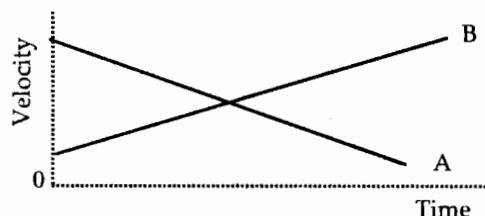
No. (ahead as in one car w/ x greater than the other)

d) Does either object A or B reverse direction? Explain.

No

velocity is always \oplus

Graph 2



a) Is one faster than the other? If so, which one is faster? (A or B)

Yes A's faster at first, B is faster at the end

b) What does the intersection mean?

they are at the same velocity at time t

c) Can one tell which object is "ahead"? (define "ahead")

No. ahead as in one car

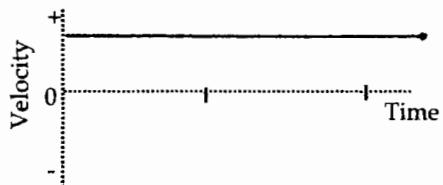
at greater x than the other.

d) Does either object A or B reverse direction? Explain.

No . velocity always \oplus

Sketch the velocity-time graph corresponding to each of the following descriptions of the motion of an object.

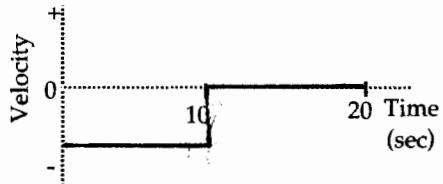
7. The object is moving away from the origin at a steady (constant) velocity.



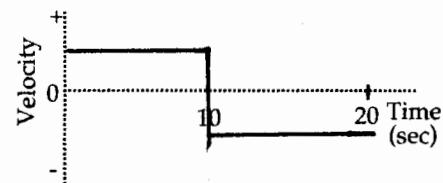
8. The object is standing still.



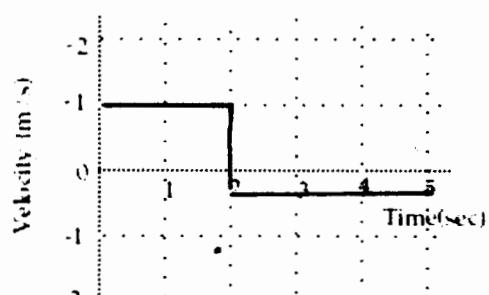
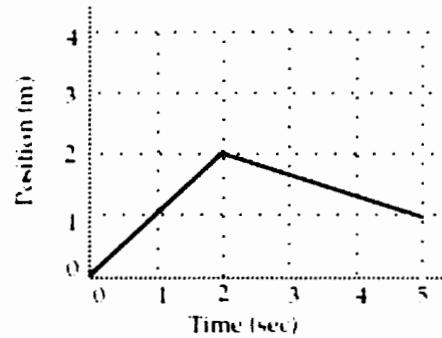
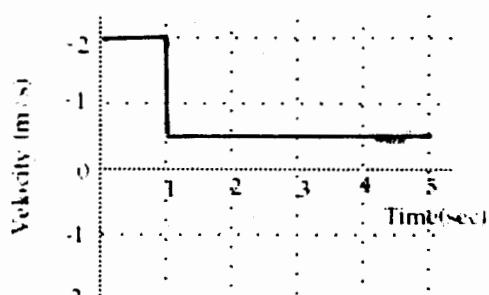
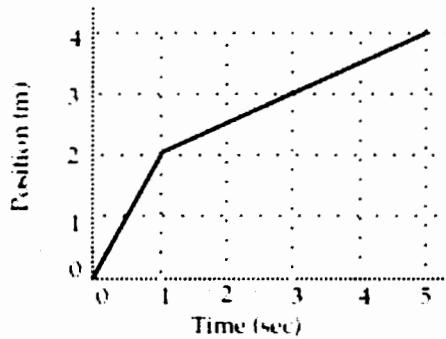
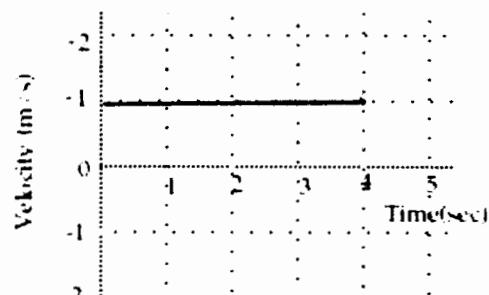
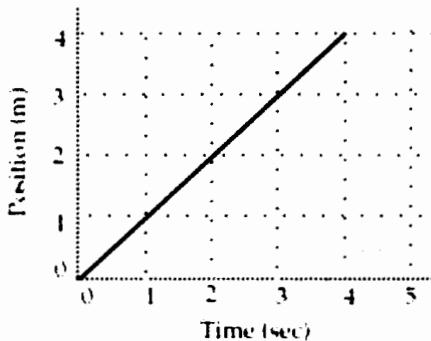
9. The object moves toward the origin at a steady (constant) velocity for 10 seconds, and then stands still for 10 seconds.



10. The object moves away from the origin at a steady (constant) velocity for 10 seconds, reverses direction and moves back toward the origin at the same speed for 10 seconds.

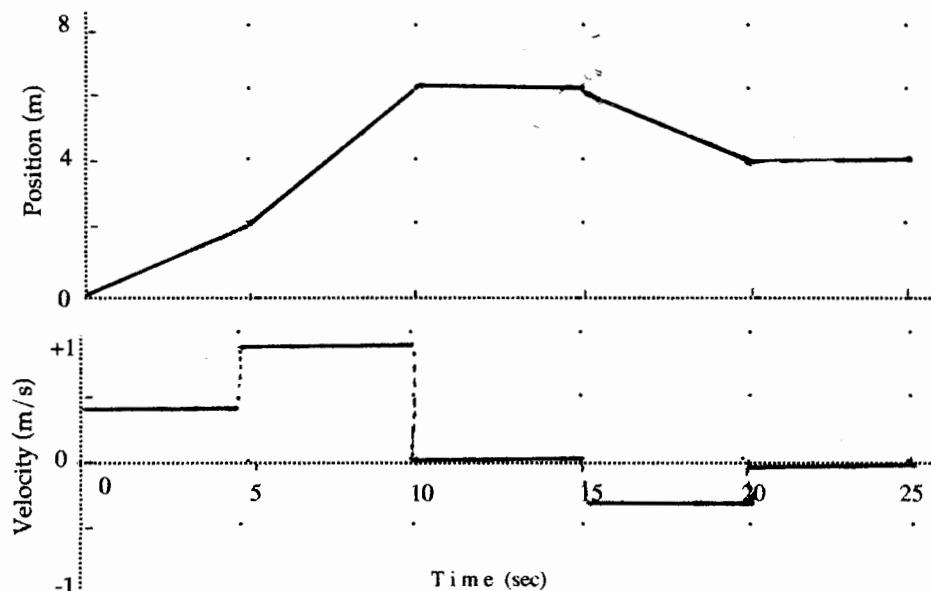


11. Draw the velocity graphs for an object whose motion produced the position-time graphs shown below on the left. Position is in meters and velocity in meters per second. **Note:** Unlike most real objects, you can assume these objects can change velocity so quickly that it looks instantaneous with this time scale.

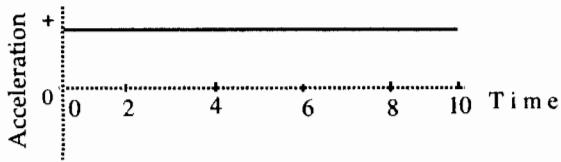


12. Draw careful graphs below of position and velocity for a cart that—

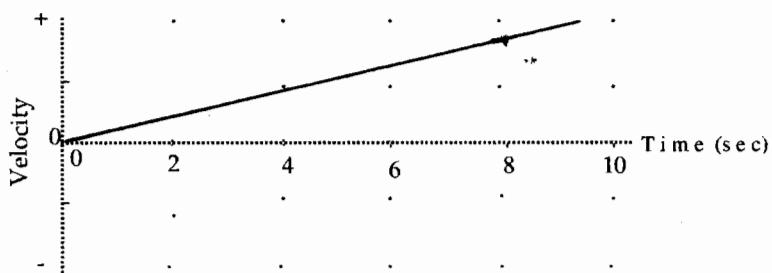
- a. moves away from the origin at a slow and *steady* (constant) velocity for the first 5 seconds.
- b. moves away at a medium-fast, *steady* (constant) velocity for the next 5 seconds.
- c. stands still for the next 5 seconds.
- d. moves toward the origin at a slow and *steady* (constant) velocity for the next 5 seconds.
- e. stands still for the last 5 seconds.



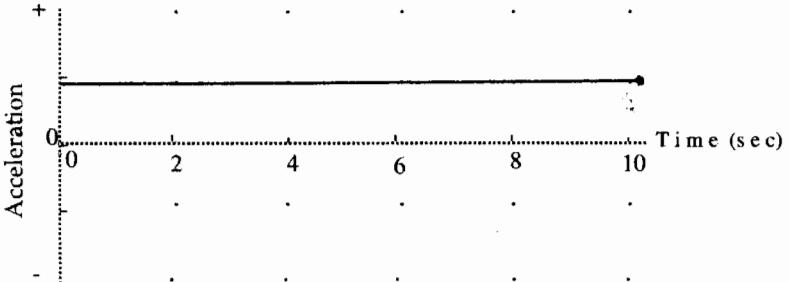
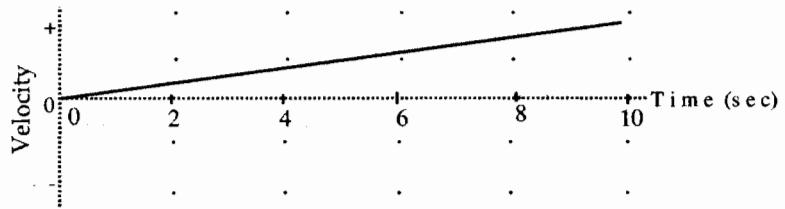
HOMEWORK FOR LAB 2: CHANGING MOTION

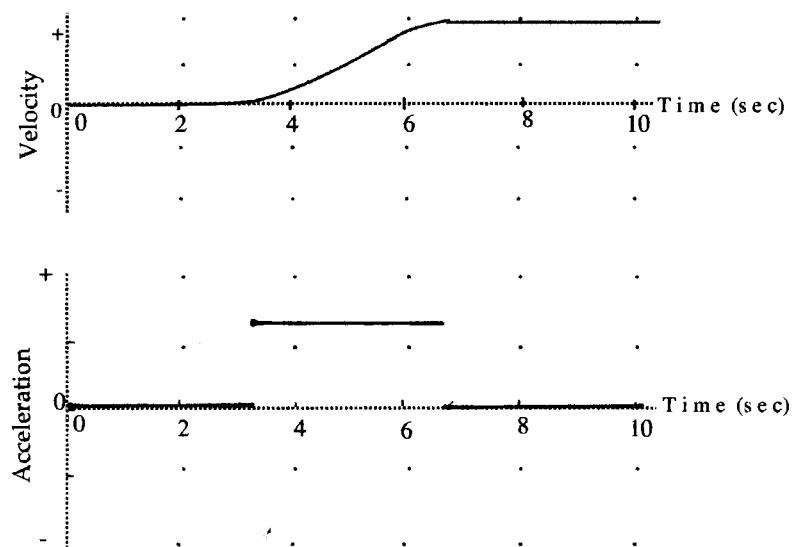


1. An object moving along a line (the + position axis) has the acceleration-time graph above. Describe how might the object move to create this graph if it is moving away from the origin?
move away from origin (+ dir) at constantly increasing speed.
2. Sketch on the axes below a velocity-time graph that goes with the above acceleration-time graph.



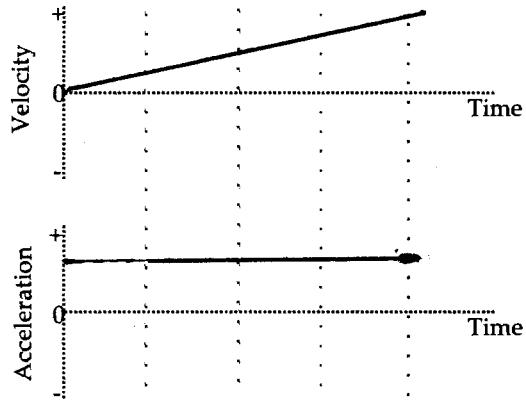
3. For each of the velocity-time graphs below, sketch the shape of the acceleration-time graph that goes with it.



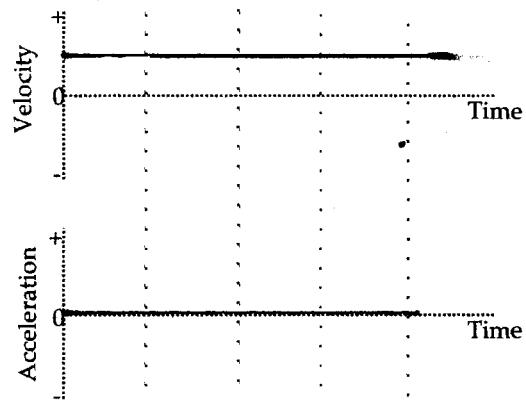


A car can move along a line (the + position axis). Sketch velocity-time and acceleration-time graphs which correspond to each of the following descriptions of the car's motion.

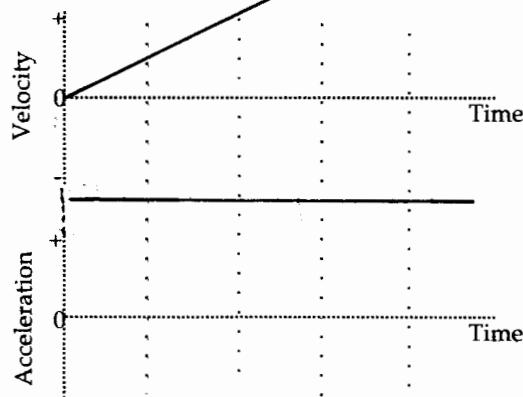
4. The car starts from rest, and moves away from the origin increasing its speed at a steady rate.



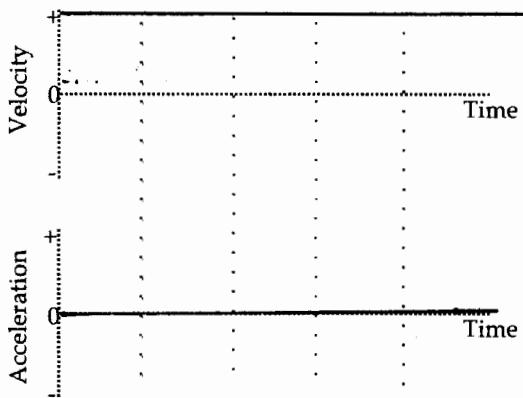
5. The car is moving away from the origin at a constant velocity.



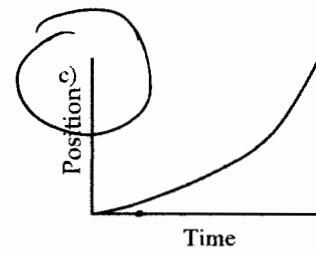
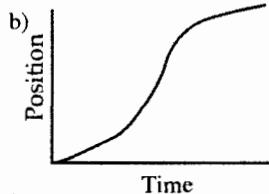
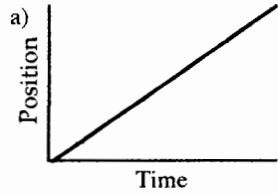
6. The car starts from rest, and moves away from the origin increasing its speed at a steady rate twice as large as in (4) above.



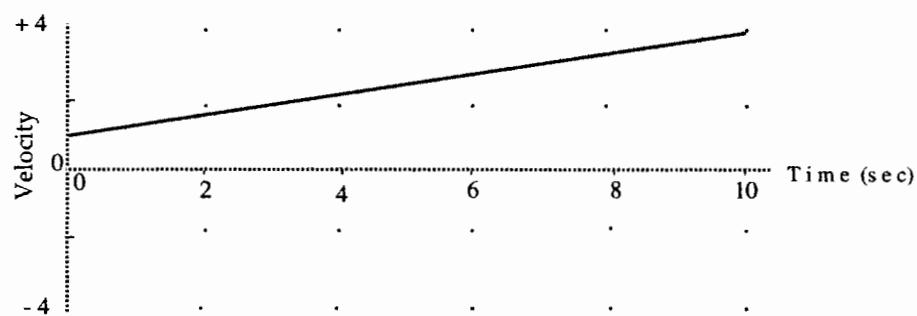
7. The car is moving away from the origin at a constant velocity twice as large as in (5) above.



8. Which position-time graph below could be that for a cart that is steadily accelerating away from the origin?



9. The following is a velocity-time graph for a car.



What is the average acceleration of the car? Show your work below.

$$a_{av} = \frac{\Delta v}{\Delta t} = \frac{(4 - 1) \text{ m/s}}{10 \text{ s}} = 0.3 \text{ m/s}^2.$$