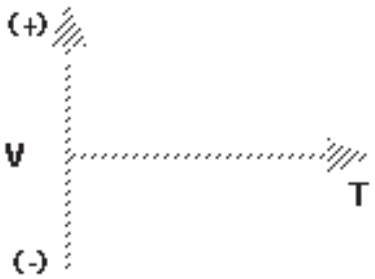
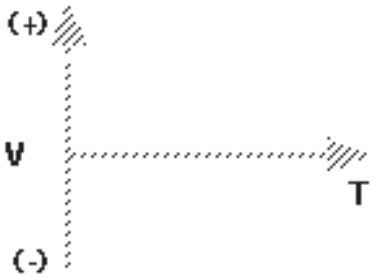
Worksheet 3

Sketch velocity vs time graphs corresponding to the following descriptions of the motion of an object.

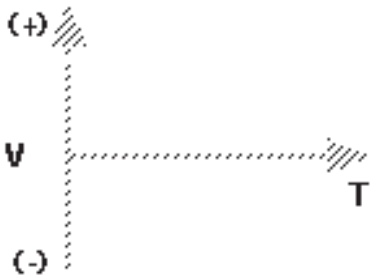
1. The object is moving away from the origin at a constant (steady) speed.



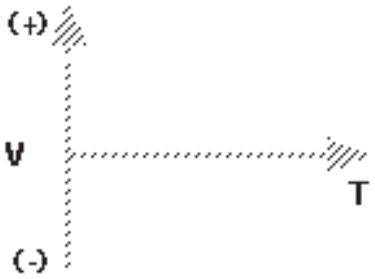
2. The object is standing still.



3. The object moves toward the origin at a steady speed for 10s, then stands still for 10s.

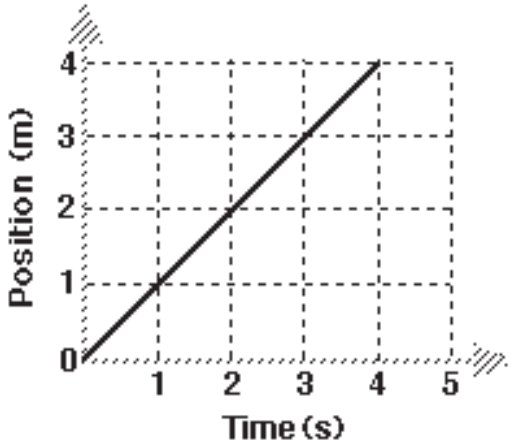


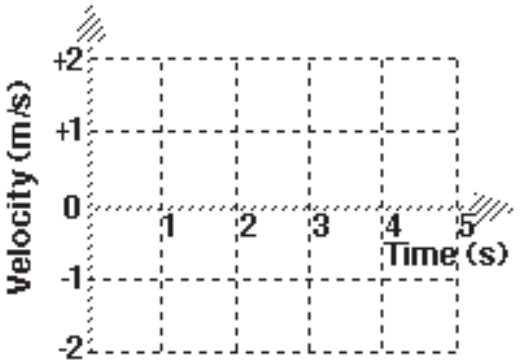
4. The object moves away from the origin at a steady speed for 10s, reverses direction and moves back toward the origin at the same speed.



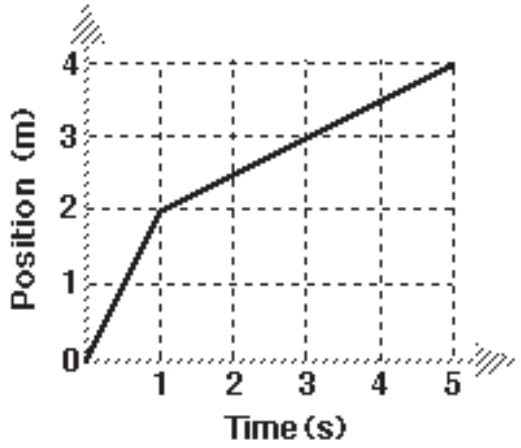
Draw the velocity vs time graphs for an object whose motion produced the position vs time graphs shown below at left.

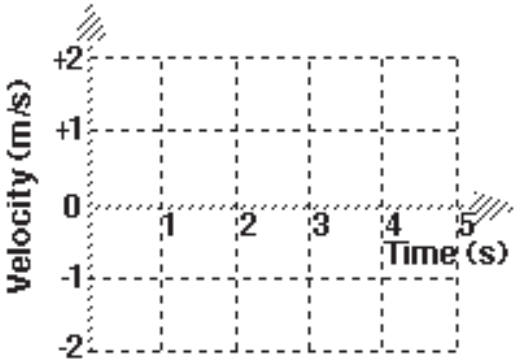
5.


Position (m)
0
1
2
3
4
Time (s)
1
2
3
4
5

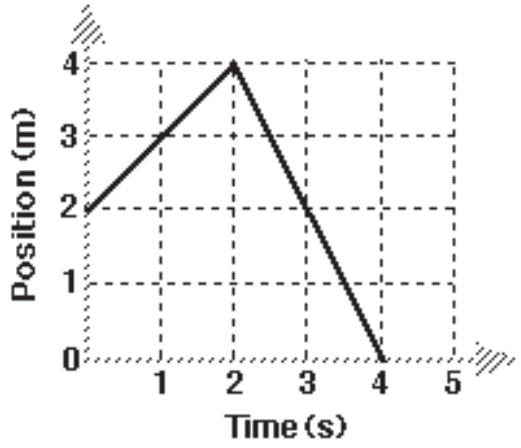

Velocity (m/s)
+2
+1
0
-1
-2
Time (s)
1
2
3
4
5

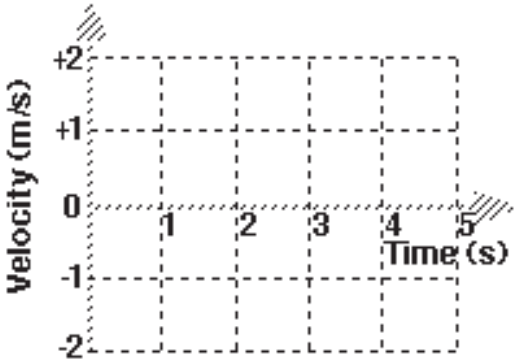
6.


Position (m)
0
1
2
3
4
Time (s)
1
2
3
4
5


Velocity (m/s)
+2
+1
0
-1
-2
Time (s)
1
2
3
4
5

7.

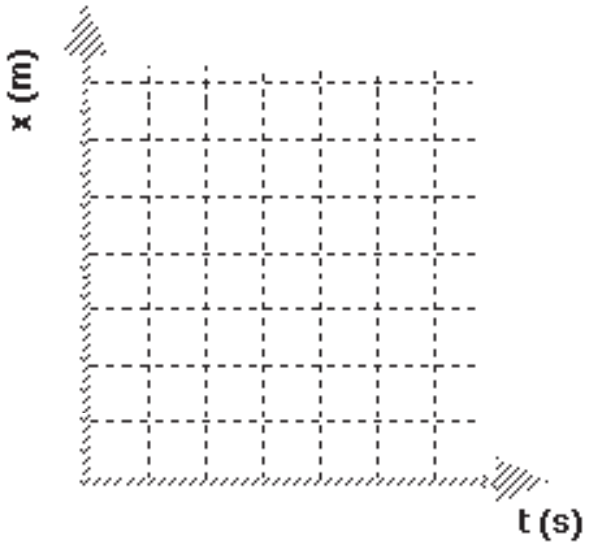

Position (m)
0
1
2
3
4
Time (s)
1
2
3
4
5


Velocity (m/s)
+2
+1
0
-1
-2
Time (s)
1
2
3
4
5

Worksheet 4

1. Robin, roller skating down a marked sidewalk, was observed to be at the following positions at the times listed below:

t (s)	x (m)
0.0	10.0
1.0	12.0
2.0	14.0
5.0	20.0
8.0	26.0
10.0	30.0



a. Plot a position vs. time graph for the skater.

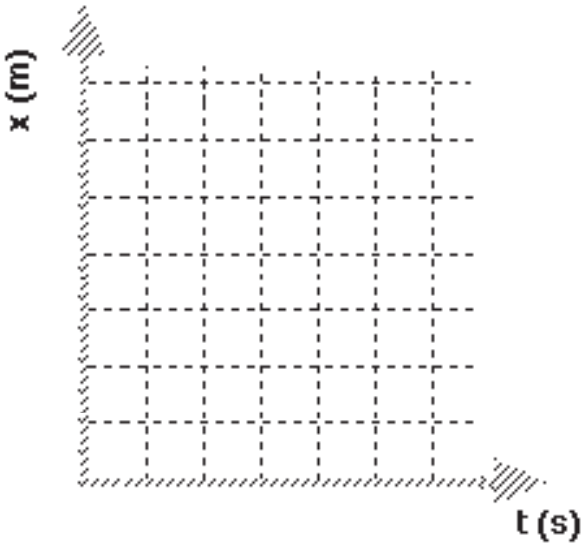
b. How far from the starting point was he at t = 6s? How do you know?

c. Write a mathematical model to describe the curve in (a).

d. Was his speed constant over the entire interval? How do you know?

2. The following data were obtained for a second trial:

t (s)	x (m)
0.0	4.0
2.0	10.0
4.0	16.0
6.0	22.0
8.0	28.0
10.0	34.0



a. Plot the position vs. time graph for the skater.

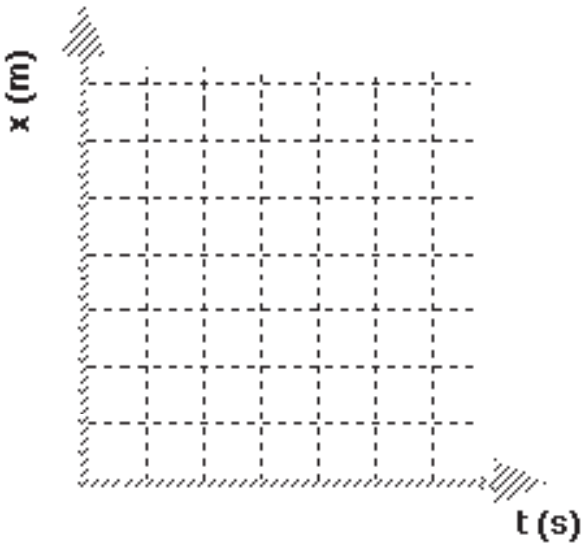
b. How far from the starting point was he at t = 5s? How do you know?

c. Was his speed constant? If so, what was it?

d. In the first trial the skater was further along at 2s than he was in the second trial. Does this mean that he was going faster? Explain your answer.

3. Suppose now that our skater was observed in a third trial. The following data were obtained:

t (s)	x (m)
0.0	0.0
2.0	6.0
4.0	12.0
6.0	12.0
8.0	8.0
10.0	4.0
12.0	0.0



a. Plot the position vs. time graph for the skater.

b. What do you think is happening during the time interval: t = 4s to t = 6s? How do you know?

c. What do you think is happening during the time interval: t = 6s to t = 12s? How do you know?

d. Determine the skater's average **speed** from t = 0s to t = 12s.

e. Determine the skater's average **velocity** from t = 0s to t = 12s.

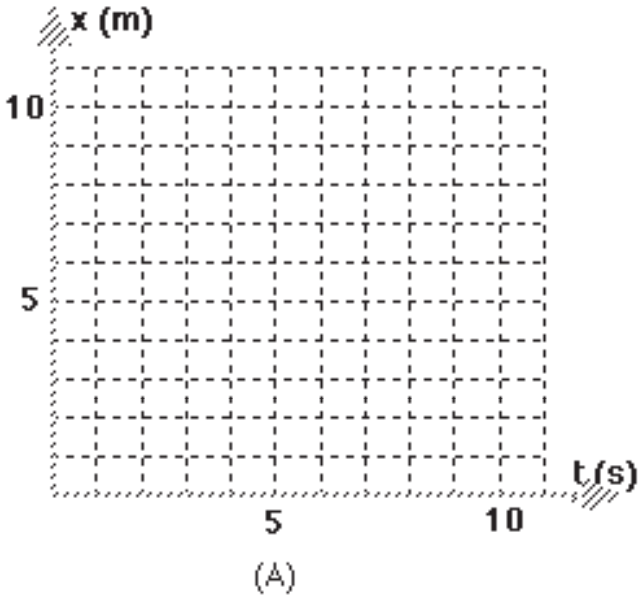
Worksheet 5

2. From the position vs time data below, answer the following questions.

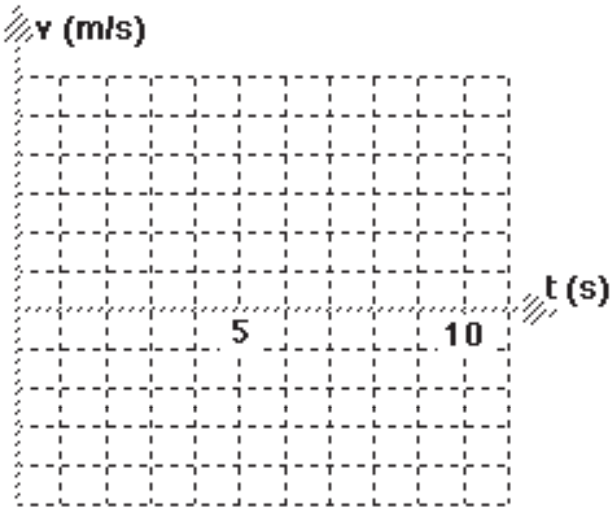
t (s)	x (m)
0	0
1	2
2	4
3	4
4	7
5	10
6	10
7	10
8	5
9	0

a. Construct a graph of position vs time.

b. Construct a graph of velocity vs time.



(A)

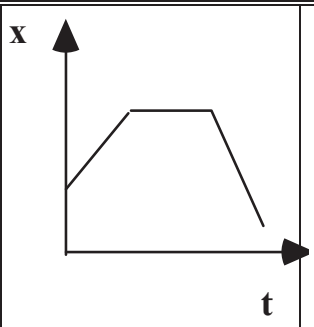
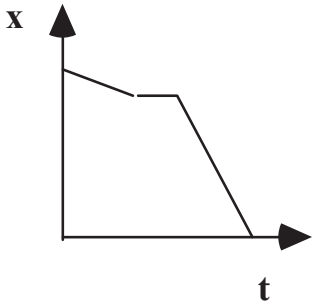
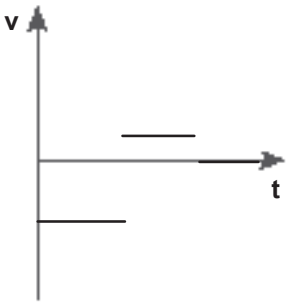
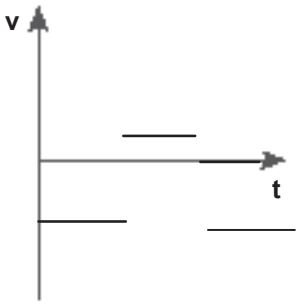


(B)

d. Determine the displacement from t = 3.0s to 5.0s using graph B.

e. Determine the displacement from t = 7.0 s to 9.0 s using graph B.

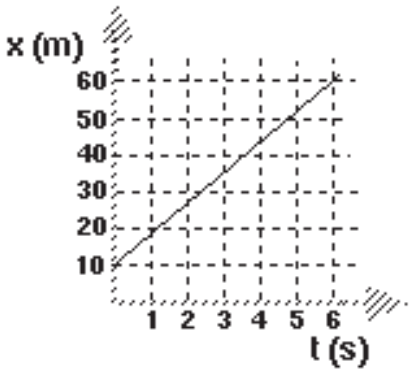
Worksheet 6

	1	2	3	4
x vs. t graph				
v vs. t graph				
Written Description				

	5	6
x vs. t graph		
v vs. t graph		
Written Description	Object moves with constant positive velocity for 4 seconds. Then, it stops for 2 seconds and returns to the initial position in 2 seconds.	Object A starts 10m to the right of the origin and moves to the left at 2 m/s. Object B starts at the origin and moves to the right at 3m/s.

Review

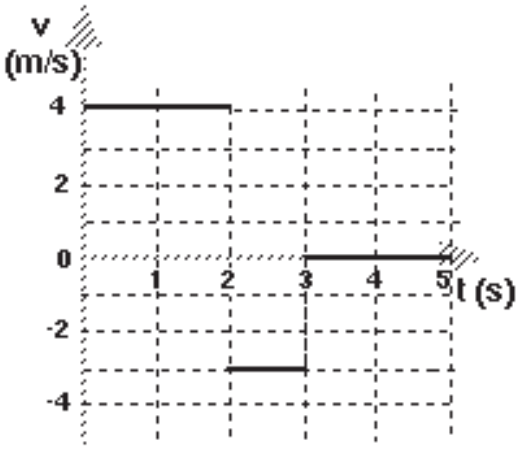
1. Consider the position vs time graph at right.



   a. Determine the average velocity of the object.

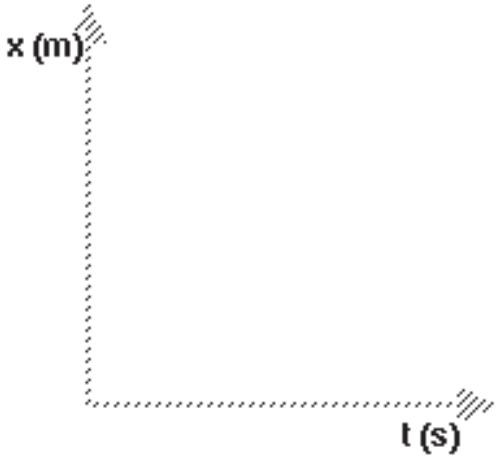
   b. Write a mathematical equation to describe the motion of the object.

2. Shown at right is a velocity vs time graph for an object.



   a. Describe the motion of the object.

   b. Draw the corresponding position vs time graph. Number the x - axis.



   c. How far did the object travel in the interval t =1s to t =2s?

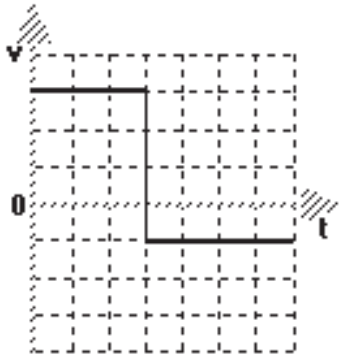
   d. What is the total displacement? Explain how you got the answer.

3. Johnny drives to Wisconsin (1920 miles) in 32 hours. He returns home by the same route in the same amount of time.
   a. Determine his average speed.

   b. Determine his average velocity.

   c. Compare these two values and explain any differences.

4. Consider the v vs t graph below.



   a. Describe the behavior of the object depicted in the graph.

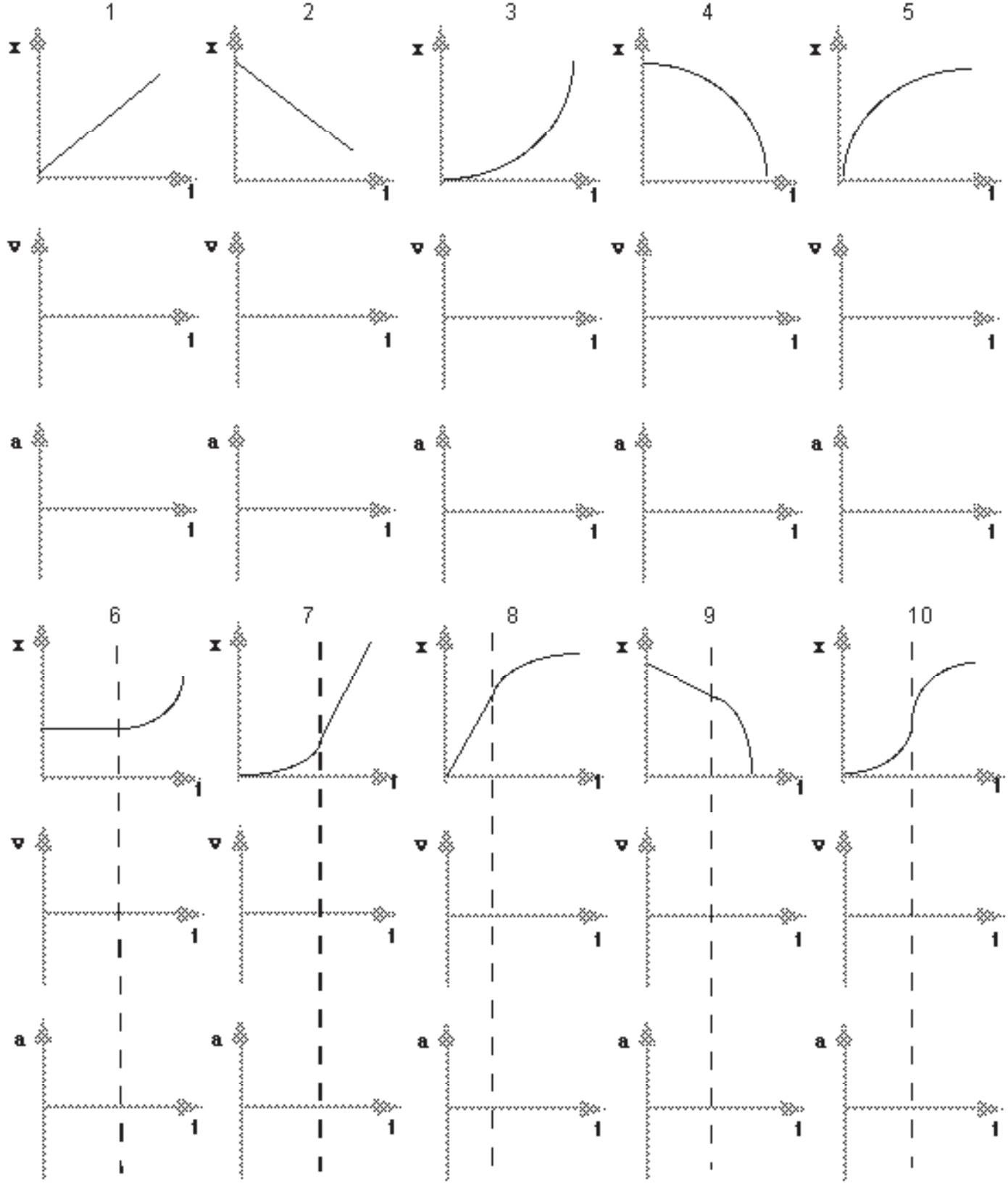
5. A race car travels at a speed of 95 m/s. How far does it travel in 12.5 s? Use the appropriate mathematical expression and show how units cancel.

6. A ball rolls up a hill with a velocity of 2.5 m/s. It is being accelerated with a constant –0.4 m/s^2. What is its velocity after 3.0 s?

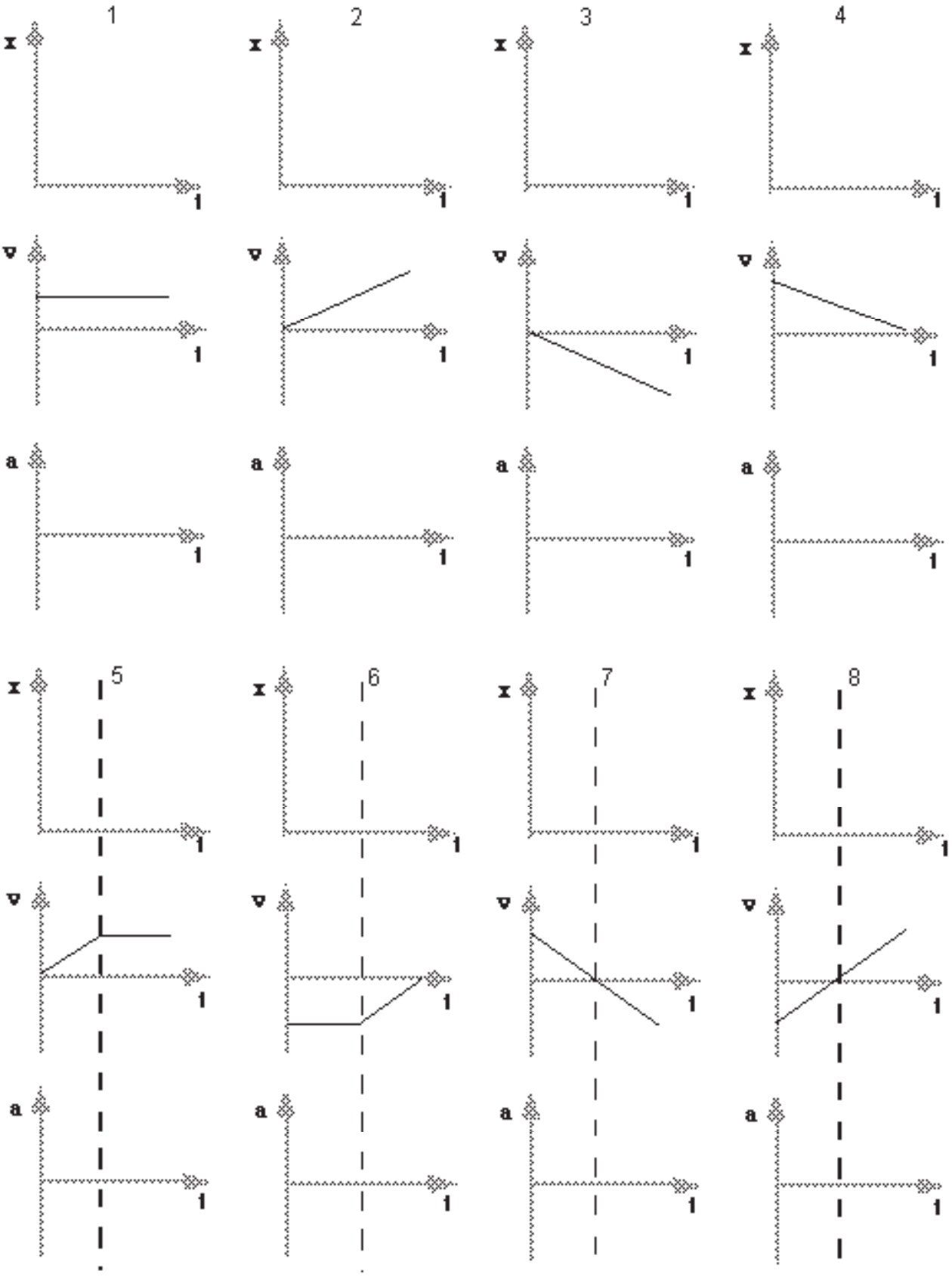
7. A race car slows from 50 m/s to 22.3 m/s in 2.8 s. What is the cars acceleration?

Worksheet 7: Stacks of kinematics curves

Given the following position vs time graphs, sketch the corresponding velocity vs time and acceleration vs time graphs.



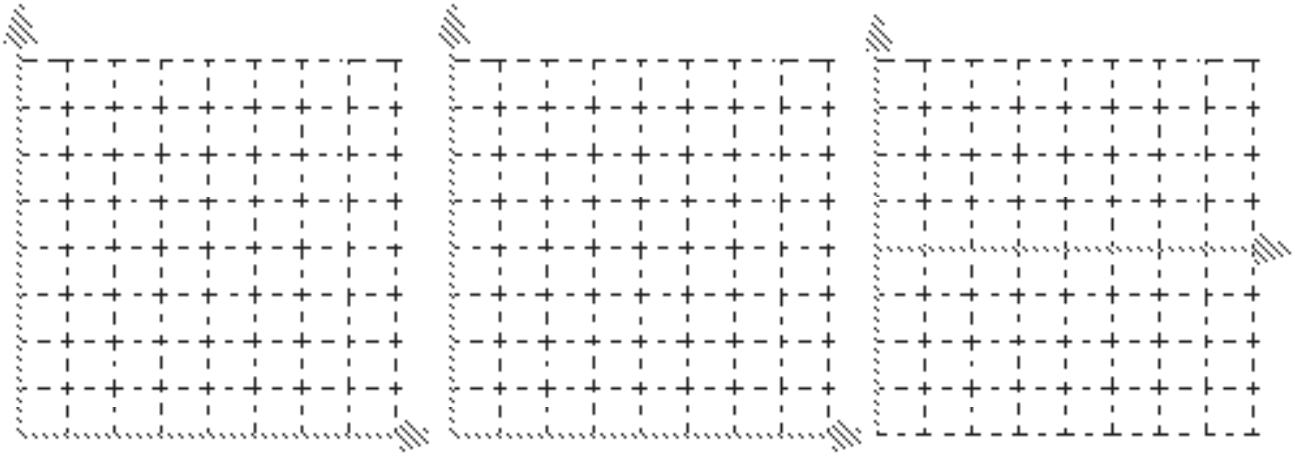
For the following velocity vs. time graphs, draw the corresponding position vs. time and a-t graphs



Worksheet 8

While cruising along a dark stretch of highway with the cruise control set at 25 m/s (≈55 mph), you see, at the fringes of your headlights, that a bridge has been washed out. You apply the brakes and come to a stop in 4.0s. *Assume the clock starts the instant you hit the brakes.*

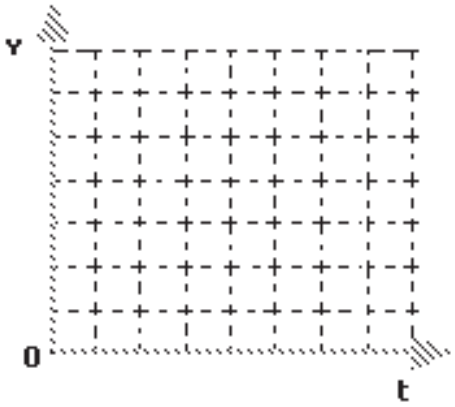
1. Construct **qualitative** graphical representations of the situation described above to illustrate:
   a. **x** vs. **t**
   b. **v** vs. **t**
   c. **a** vs. **t**



3. Construct a **quantitatively accurate v** vs **t** graph to describe the situation.

4. On the **v** vs **t** graph at right, graphically represent the car's displacement during braking.

5. Utilizing the **graphical representation**, determine how far the car traveled during braking. (Please explain your problem solving method.)



6. In order to draw the **a** vs **t** graph, you need to determine the car's acceleration. Please do this, then sketch a **quantitatively accurate a** vs **t** graph