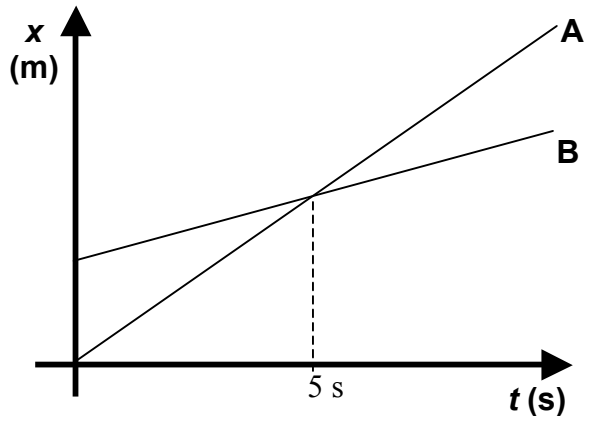
Unit 1: Uniform Motion
Worksheet 1

Name_____

Date_____Period_____

1. Consider the position vs. time graph below for cyclists A and B.



a. Do the cyclists start at the same point? How do you know? If not, which is ahead?

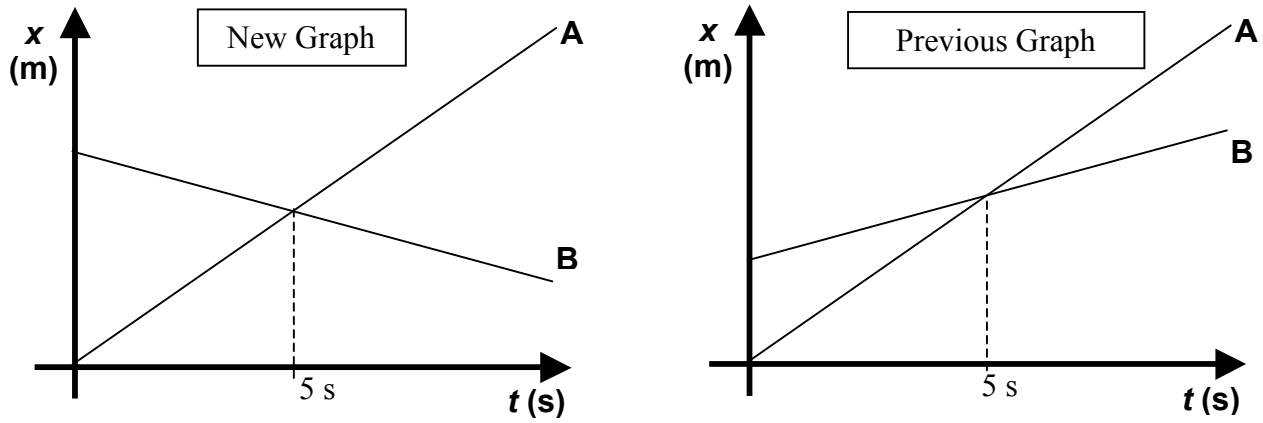
b. At t= 7s, which cyclist is ahead? How do you know?

c. Which cyclist is travelling faster at t = 3s? How do you know?

d. Are their velocities equal at any time? How do you know?

e. What is happening at the intersection of lines A and B?

2. Consider the new position vs. time graph below for cyclists A and B.



a. How does the motion of the cyclist A in the new graph compare to that of A in the previous graph from page one?

b. How does the motion of cyclist B in the new graph compare to that of B in the previous graph?

c. Which cyclist has the greater speed? How do you know?

d. Describe what is happening at the intersection of lines A and B.

e. Which cyclist traveled a greater distance during the first 5 seconds? How do you know?

Unit 1: Uniform Motion
Worksheet 3
Multiple Representations of Motion Practice

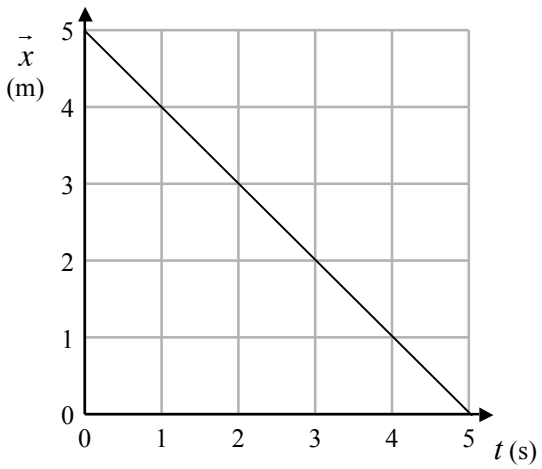
Name_____

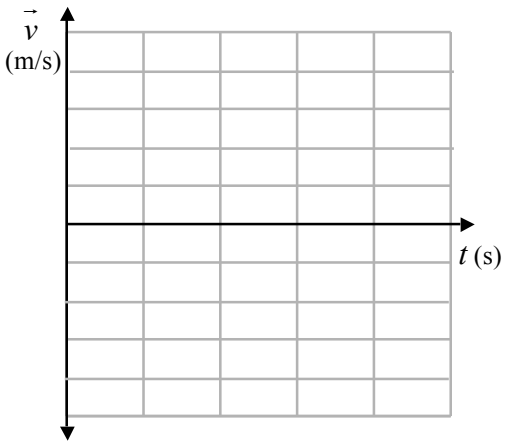
Date_____Period_____

For each of the following position vs. time graphs do the following.

a. Produce a Motion Map from each position vs. time graph. Include one dot every 0.5 s.
b. Calculate the average velocity of the object for each portion of the graph.
c. Write an equation which describes the motion of the object. (Not required for problem 4)
d. Plot a quantitative velocity vs. time graph which corresponds to the position vs. time graph

1.





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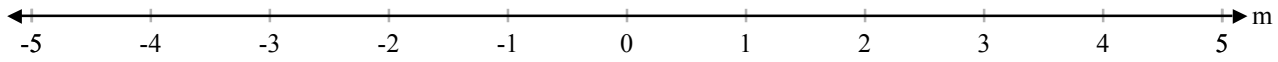
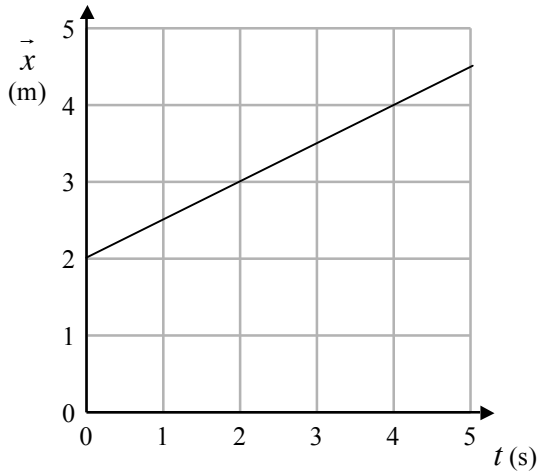
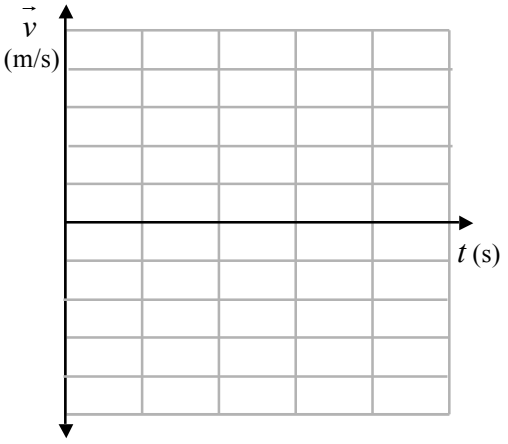
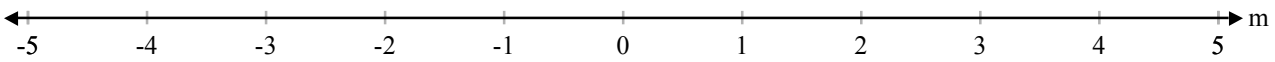


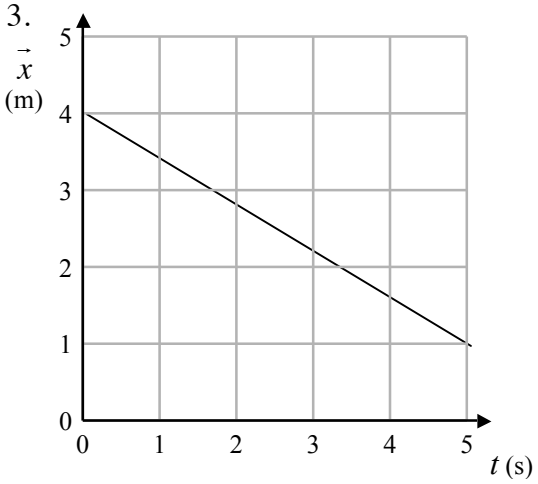
2.

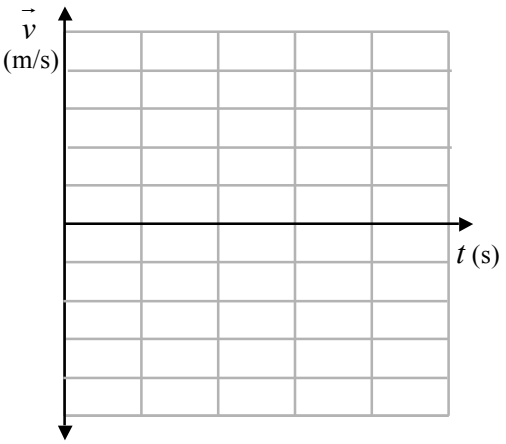




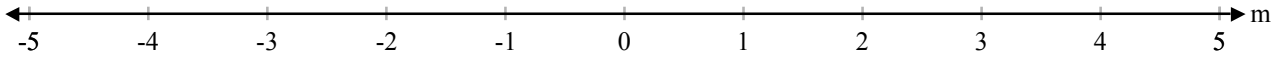


3.

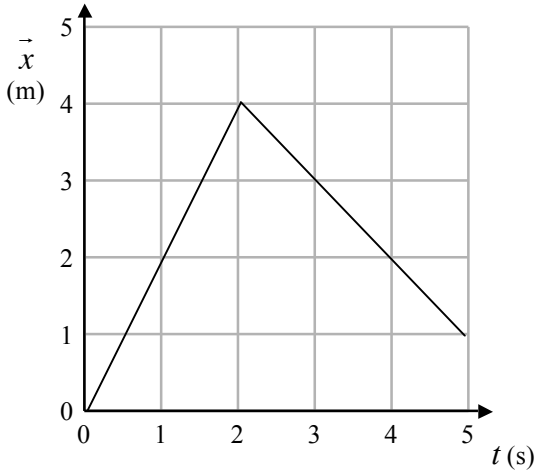

$\vec{x}$ (m)
5
4
3
2
1
0
0 1 2 3 4 5
t (s)

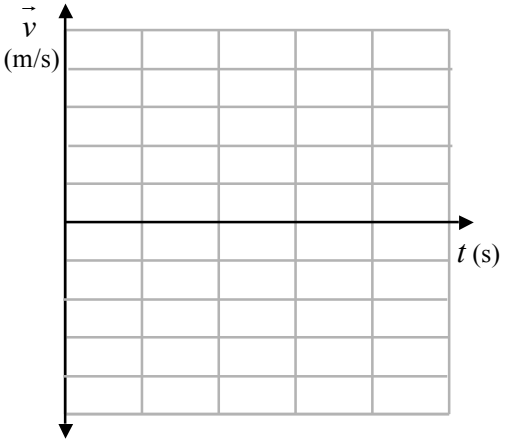

$\vec{v}$ (m/s)
t (s)

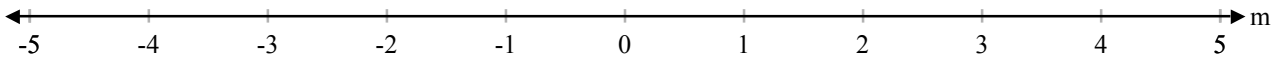
-


-5 -4 -3 -2 -1 0 1 2 3 4 5
m

4.


$\vec{x}$ (m)
5
4
3
2
1
0
0 1 2 3 4 5
t (s)


$\vec{v}$ (m/s)
t (s)


-5 -4 -3 -2 -1 0 1 2 3 4 5
m

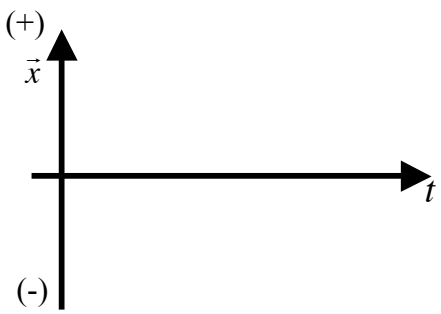
Unit 1: Uniform Motion
Worksheet 4

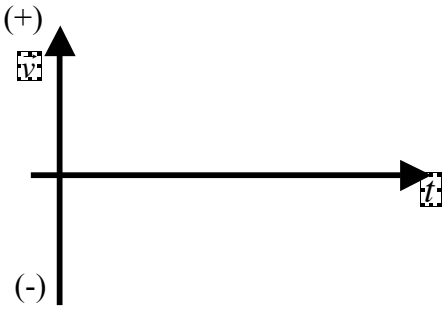
Name_____

Date_____Period_____

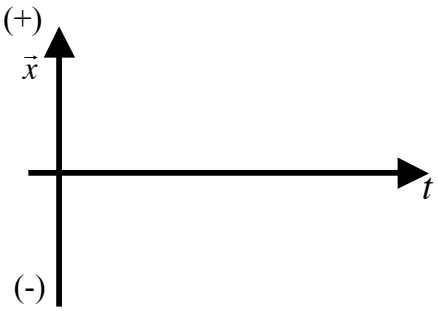
Sketch velocity vs. time graphs corresponding to the following descriptions of the motion of an object.

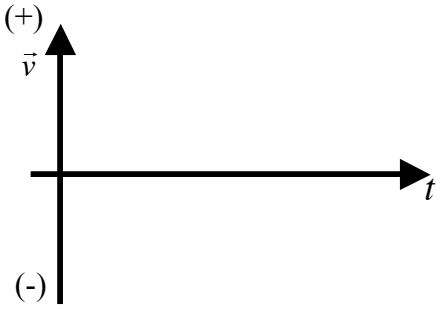
1. The object is moving away from position 0 at a constant (steady) speed.



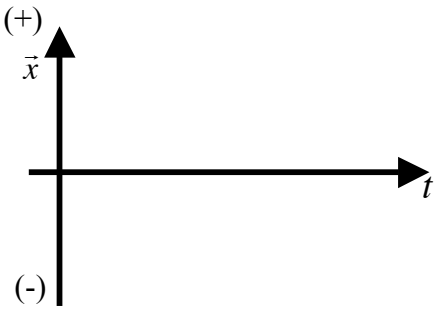


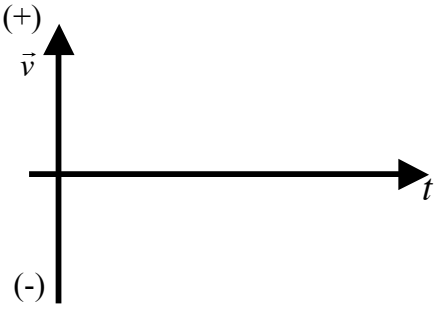
2. The object is standing still.



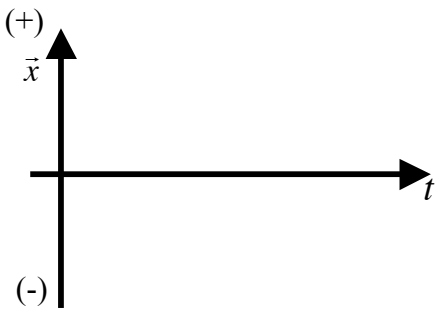


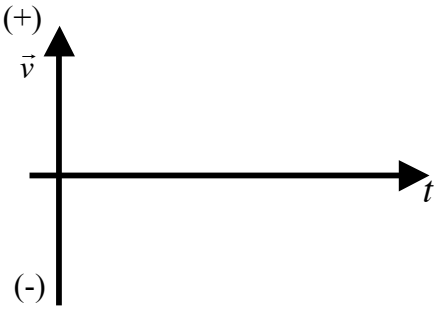
3. The object moves toward position 0 at a steady speed for 10s, then stands still for 10s.





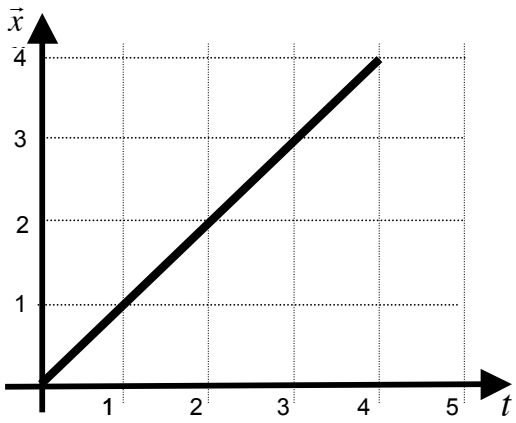
4. The object moves away from position 0 at a steady speed for 10s, reverses direction and moves back toward position 0 at the same speed.

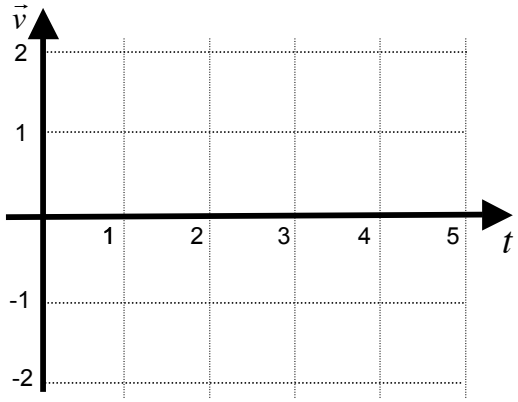




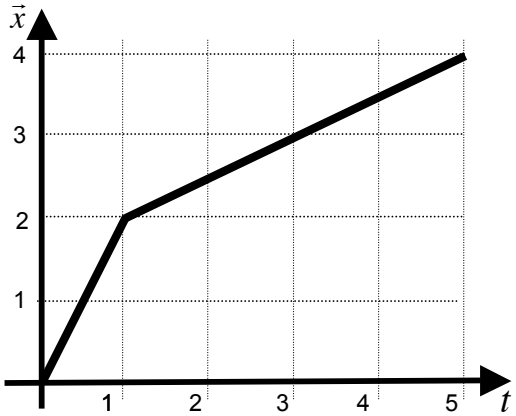
Draw the (quantitative) velocity vs. time graphs for an object whose motion produced the position vs. time graphs shown below at left. Show slope calculations in margin at right and at the bottom of the page. Assume all position axes are scaled in meters, time axes in seconds, and velocity axes in m/s.

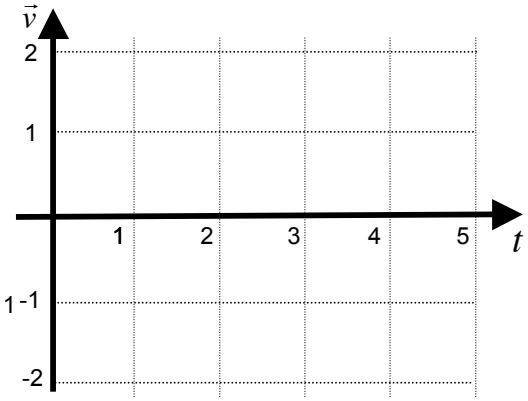
5.



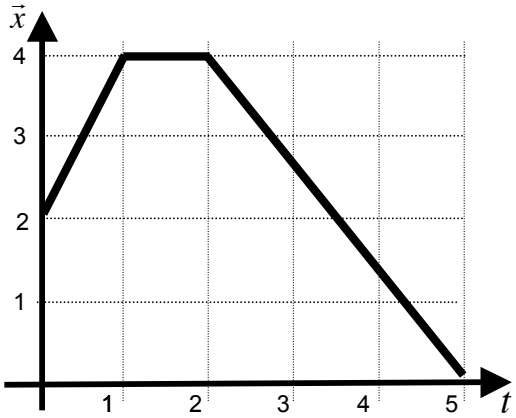


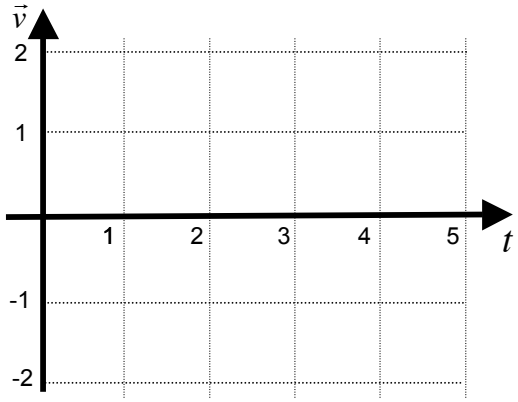
6.





7.





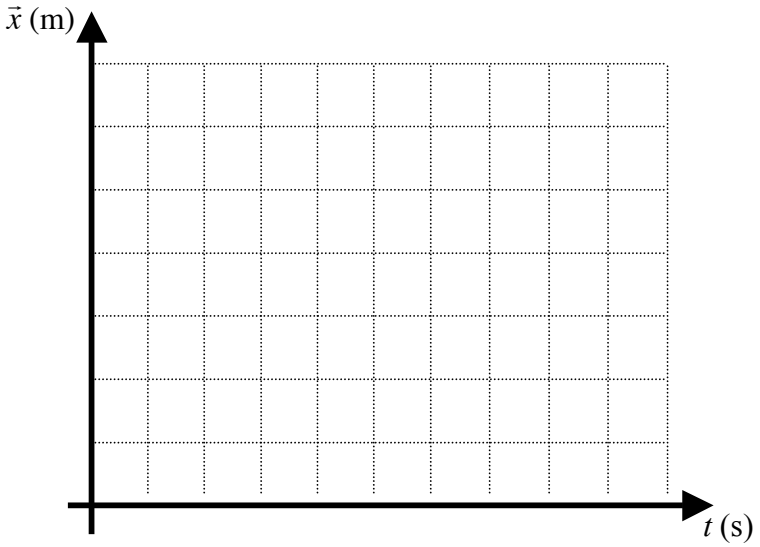
Unit 1: Uniform Motion
Worksheet 5a

Name_____

Date_____**Period**_____

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

t (s)	$\vec{x}$ (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. On the axes above, plot a position vs. time graph for the skater.

b. How far from Robin's starting point was she at t = 6.0 s? How do you know?

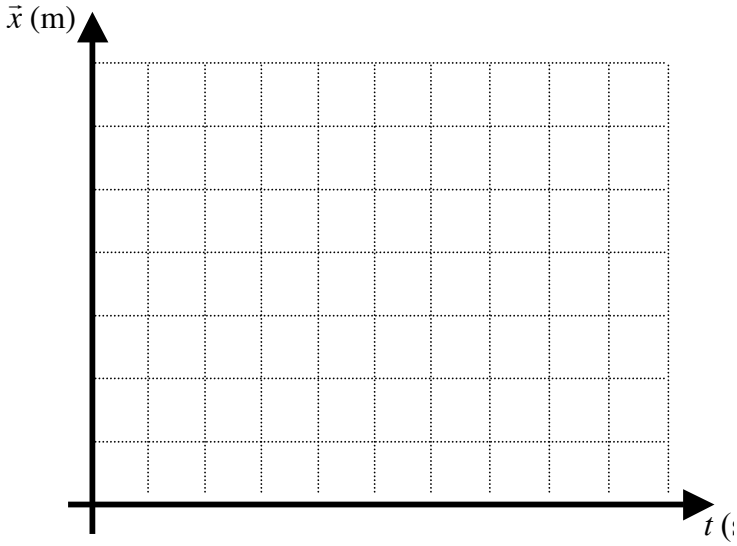
c. What was Robin's average velocity? How do you know? Show work.

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

e. Was her speed constant over the entire interval? How do you know?

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

t (s)	$\vec{x}$ (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 her starting point was she at t = 5.0 s? How do you know?

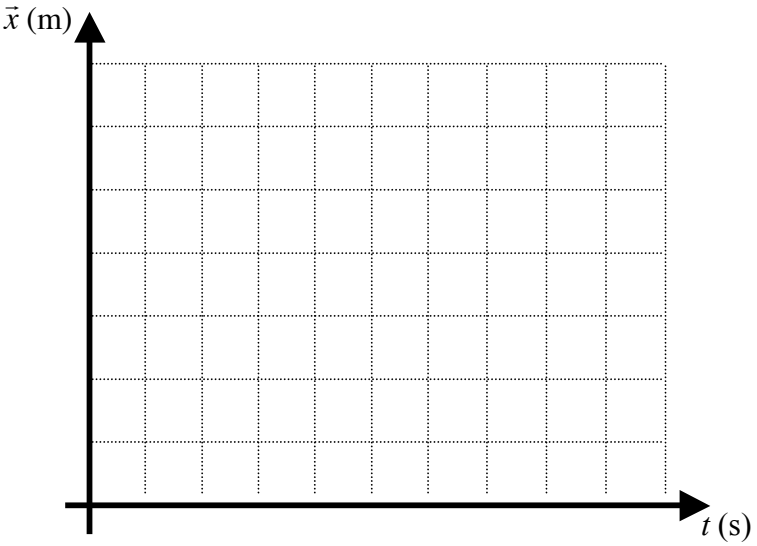
c. Was her speed constant? If so, what was it? Show work.

d. Write a mathematical model that describes the skater's motion.

e. In the first trial the skater was further along at 2.0 s than he was in the second trial. Does this mean that she 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)	$\vec{x}$ (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 = 4.0 s to t = 6.0 s? How do you know?

c. What do you think is happening during the time interval: t = 6.0 s to t = 12.0 s? How do you know?

d. What was the distance that the skater traveled from t = 0 to t = 12.0 s? Show work.

e. Determine the skater's average **speed** from t = 0 to t = 12.0 s. Show work.

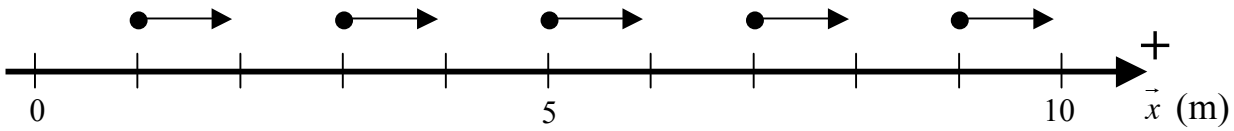
f. What was the skater's displacement from t = 0 to t = 12.0 s? Show work.

e. Determine the skater's average **velocity** from t = 0 to t = 12.0 s. Show work.

Unit 1: Uniform Motion
Worksheet 6

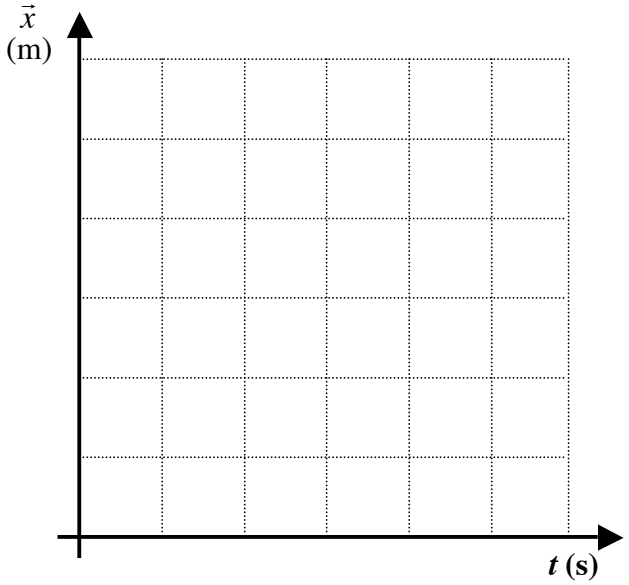
Name_____

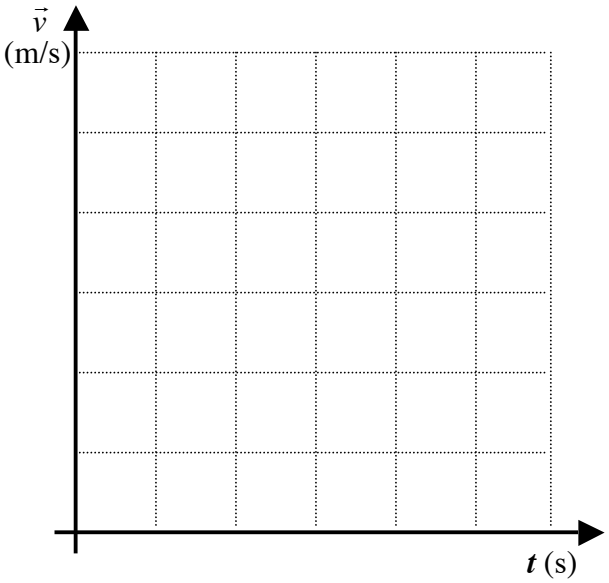
Date_____Period_____



1. The dots on the motion map above occur in 1.0 second intervals. From the motion map above, answer the following:
   a. What can you conclude about the motion of the object? Explain!

   b. Draw a quantitative graphical representation of $\vec{x}$ vs. *t* on the axes below.
   c. Draw a quantitative graphical representation of $\vec{v}$ vs. *t* on the axes below.





   d. Write a mathematical model (equation) that represents the relationship between $\vec{x}$ and *t* shown by your graph. Include both a specific (with values) and a general (variables only) equation in each case.

   e. Write a mathematical model (equation) that represents the relationship between $\vec{v}$ and *t* shown by your graph. Include both a specific (with values) and a general (variables only) equation in each case.

   f. Shade the area under the $\vec{v}$ vs. *t* graph above. What do you think this area represents?

g. From the motion map, determine the position of the object at clock readings of 0 and 4 seconds.

h. Calculate the displacement of the object between 0 and 4 seconds.

i. What is the geometric shape of the region you shaded for the $\vec{v}$ vs. *t* graph?

j. Calculate the area of the shaded region.

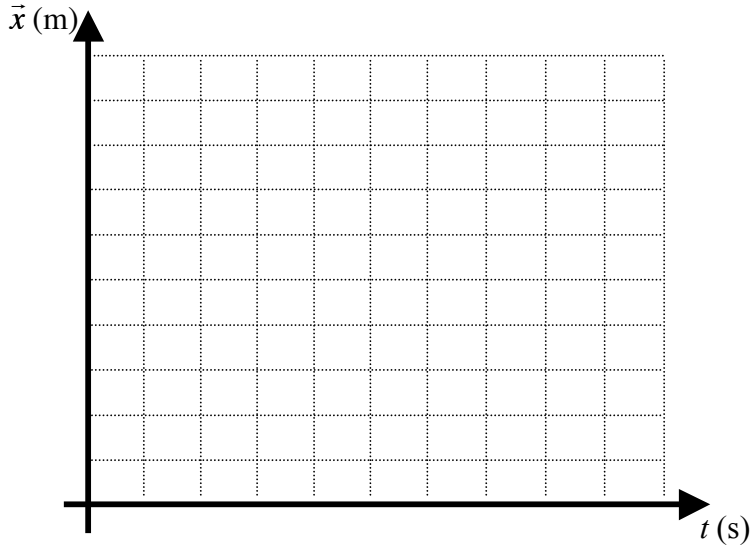
k. How does the area of the shaded region compare to the displacement calculated in part h?

l. In general what does the area under a $\vec{v}$ vs. t graph represent? Was your prediction in part f correct?

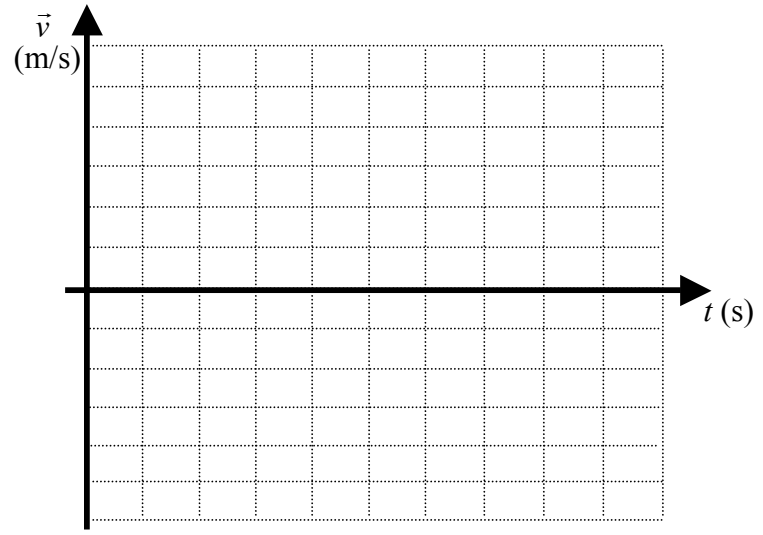
2. From the position vs time data below, do the following:

t (s)	$\vec{x}$ (m/s)
0	0
1	2
2	4
3	4
4	7
5	10
6	10
7	10
8	5
9	0

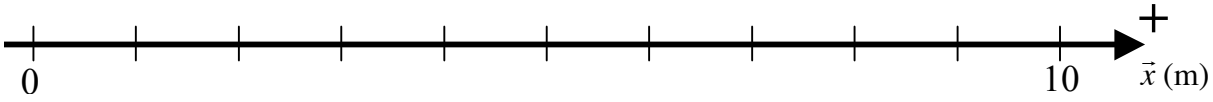
a. Construct a (quantitative) graph of position vs. time on the axes below.



b. Construct a (quantitative) graph of velocity vs. time.



c. Draw a quantitative motion map for the object.



d. Determine the displacement from t = 3.0 s to 5.0 s <u>using the velocity vs. time graph</u>. Shade the graph and show your work.

e. Determine the displacement from t = 7.0 s to t = 9.0 s <u>using the velocity vs. time graph</u>. Shade the graph and show your work.