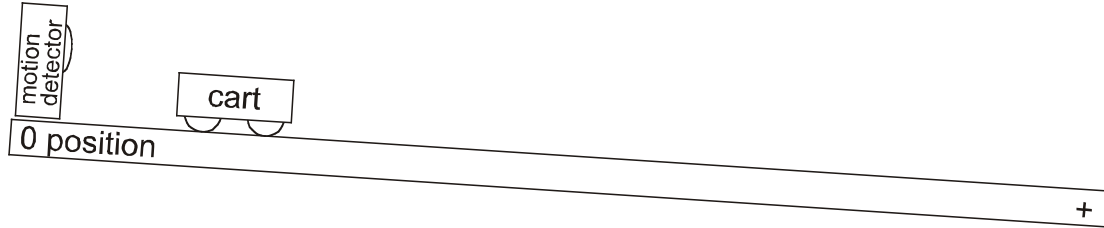


## Lab Extension: Speeding Up and Slowing Down

### 1. Speeding up, moving in the positive direction

a. Observe the motion of the cart starting from rest and rolling down the incline without using the motion detector.



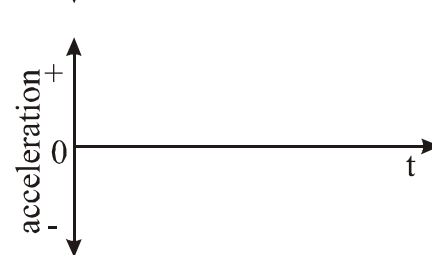
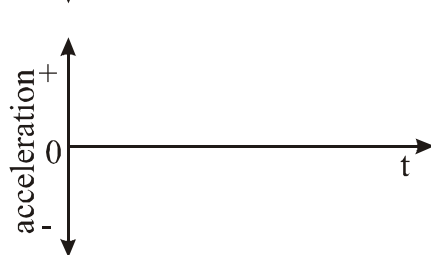
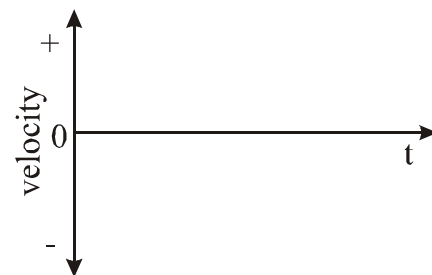
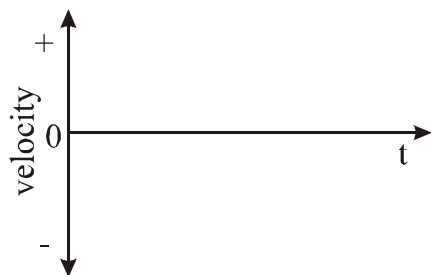
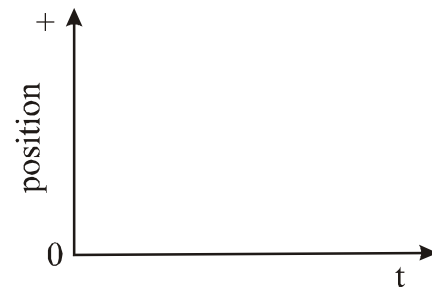
b. Draw a motion map including both velocity and acceleration vectors.

c. Is the velocity positive or negative?

d. Is the acceleration positive or negative?

e. Predict the graphs describing the motion.

f. Record the graphs as displayed by the motion detector.



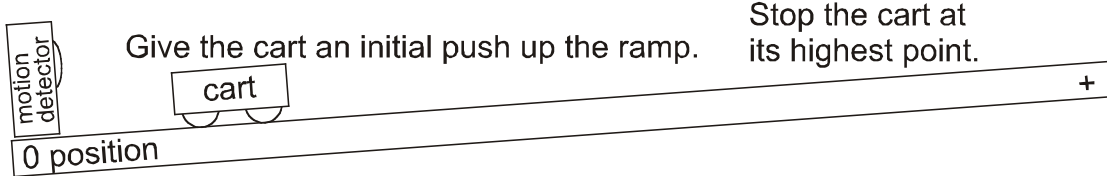
g. On the observed graphs, describe the slope as

- a) constant, increasing or decreasing
- b) positive or negative
- c) state what the slope represents

*Note: You may have to divide your graph into segments.*

## 2. Slowing down, moving in the positive direction

a. Observe the motion of the cart slowing after an initial push without using the motion detector. Answer the following questions for the cart while coasting.



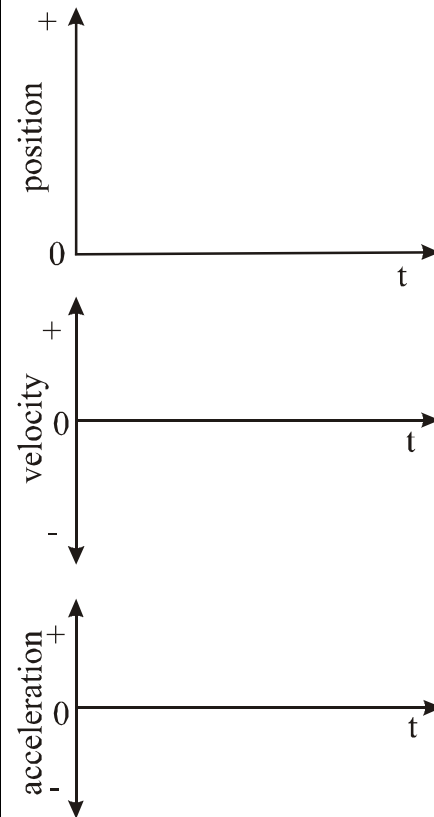
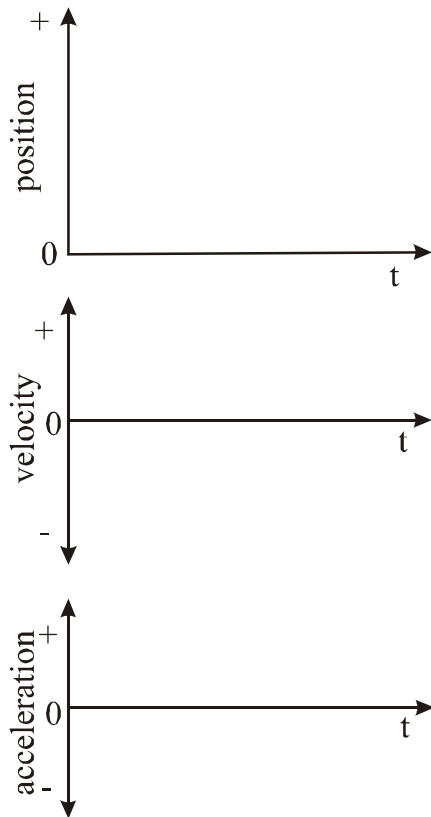
b. Draw a motion map including both velocity and acceleration vectors.

c. Is the velocity positive or negative?

d. Is the acceleration positive or negative?

e. Predict the graphs describing the motion.

f. Record the graphs as displayed by the motion detector.

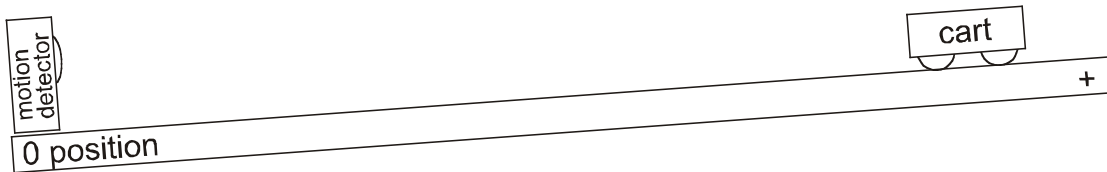


g. On the observed graphs, describe the slope as  
 a) constant, increasing or decreasing  
 b) positive or negative  
 c) state what the slope represents

*Note: You may have to divide your graph into segments.*

### 3. Speeding up, moving in the negative direction

a. Observe the motion of the cart starting from rest and rolling down the incline without using the motion detector.



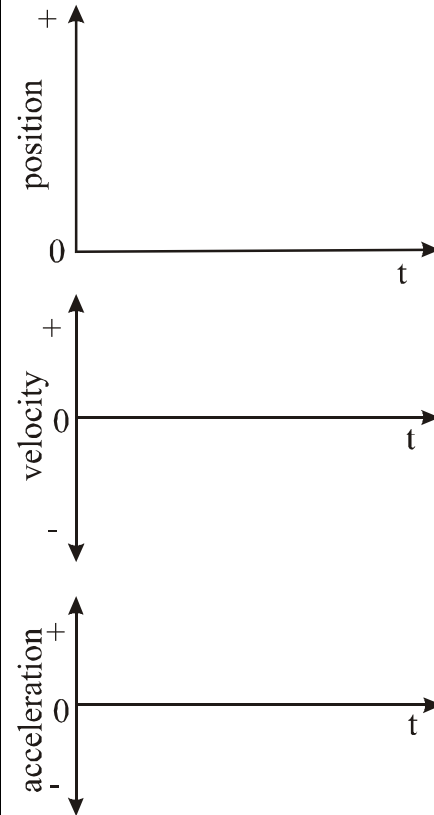
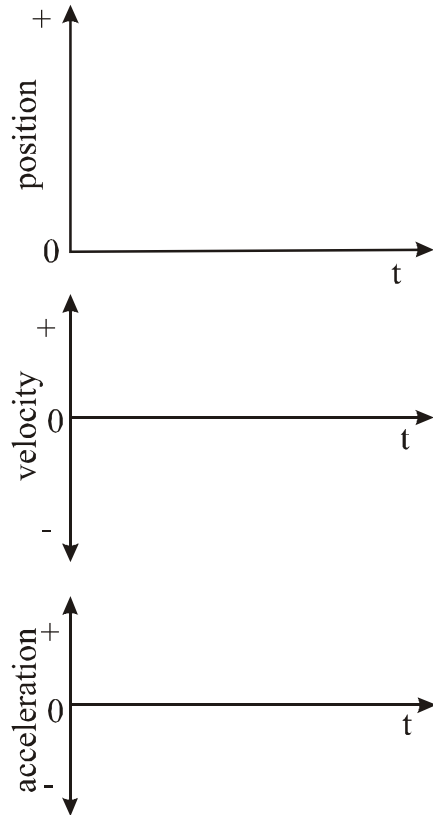
b. Draw a motion map including both velocity and acceleration vectors.

c. Is the velocity positive or negative?

d. Is the acceleration positive or negative?

e. Predict the graphs describing the motion.

f. Record the graphs as displayed by the motion detector.

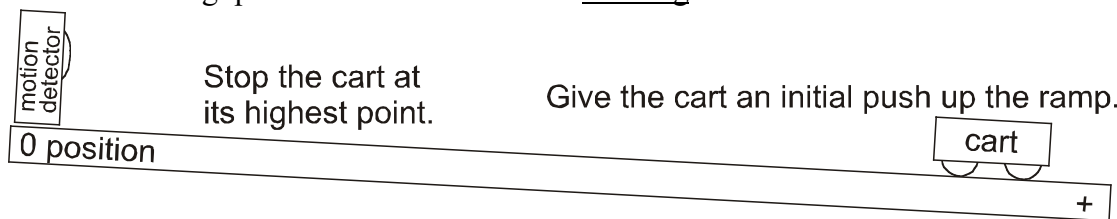


g. On the observed graphs, describe the slope as  
 a) constant, increasing or decreasing  
 b) positive or negative  
 c) state what the slope represents

*Note: You may have to divide your graph into segments.*

#### 4. Slowing down, moving in the negative direction

a. Observe the motion of the cart slowing after an initial push without using the motion detector. Answer the following questions for the cart while coasting.



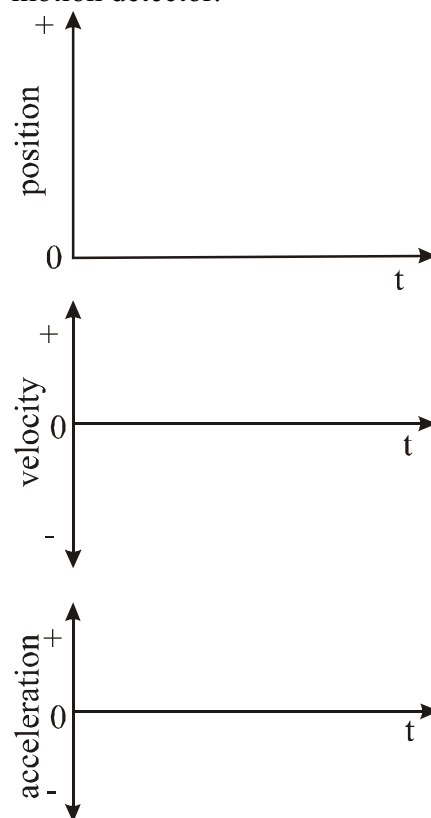
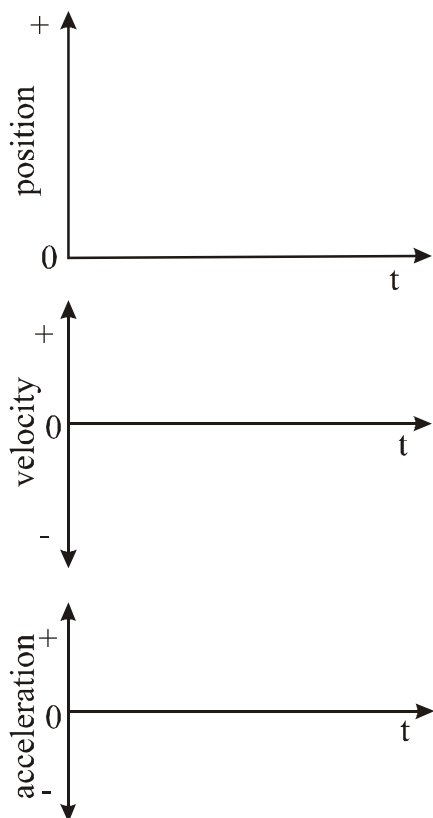
b. Draw a motion map including both velocity and acceleration vectors.

c. Is the velocity positive or negative?

d. Is the acceleration positive or negative?

e. Predict the graphs describing the motion.

f. Record the graphs as displayed by the motion detector.



g. On the observed graphs, describe the slope as

a) constant, increasing or decreasing

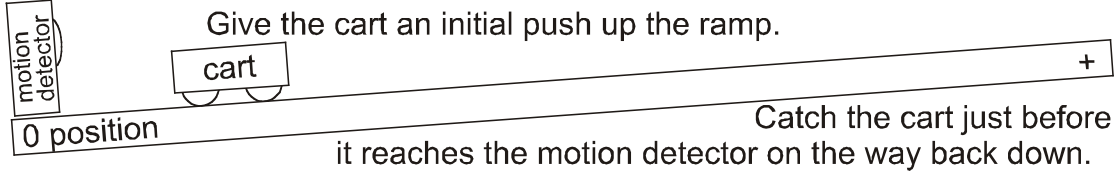
b) positive or negative

c) state what the slope represents

*Note: You may have to divide your graph into segments.*

## 5. Up and down the ramp

a. Observe the motion of the cart after an initial push without using the motion detector. Answer the following questions for the cart while coasting.



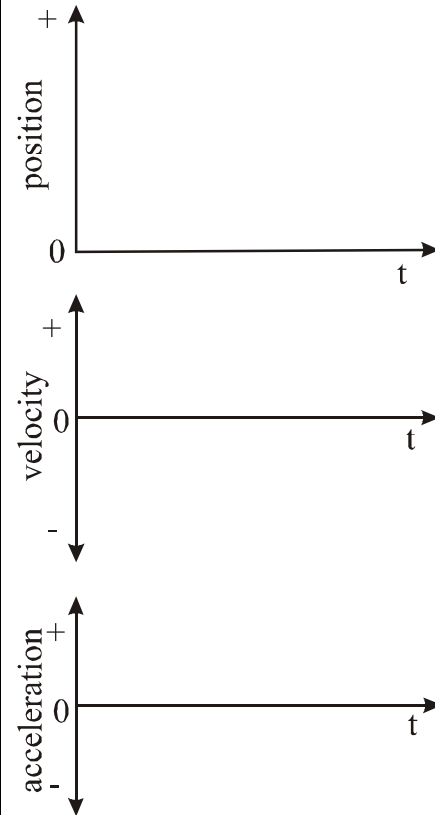
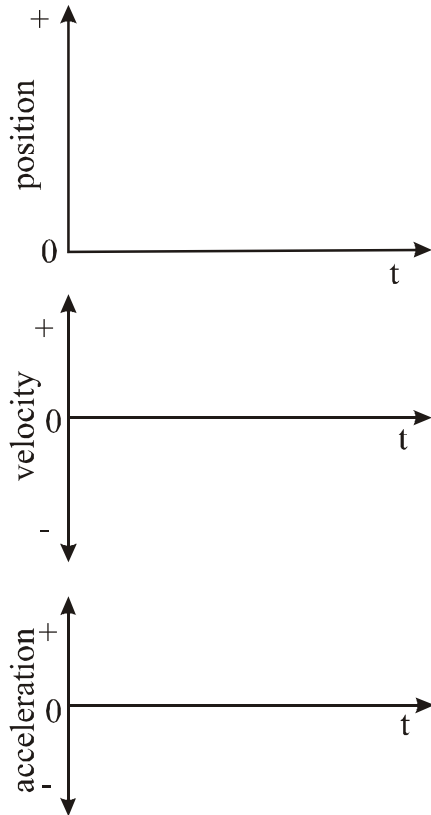
b. Draw a motion map including both velocity and acceleration vectors.

c. Is the velocity positive or negative?  
Does the direction of the velocity change?

d. Is the acceleration positive or negative?  
Does the direction of the acceleration change?

e. Predict the graphs describing the motion.

f. Record the graphs as displayed by the motion detector.



g. On the observed graphs, describe the slope as

a) constant, increasing or decreasing

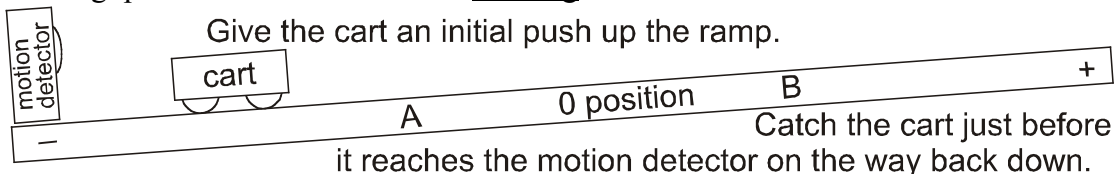
b) positive or negative

c) state what the slope represents

*Note: You may have to divide your graph into segments.*

## 6. Up and down the ramp with a different zero position

a. Observe the motion of the cart after an initial push without using the motion detector. Answer the following questions for the cart while coasting.



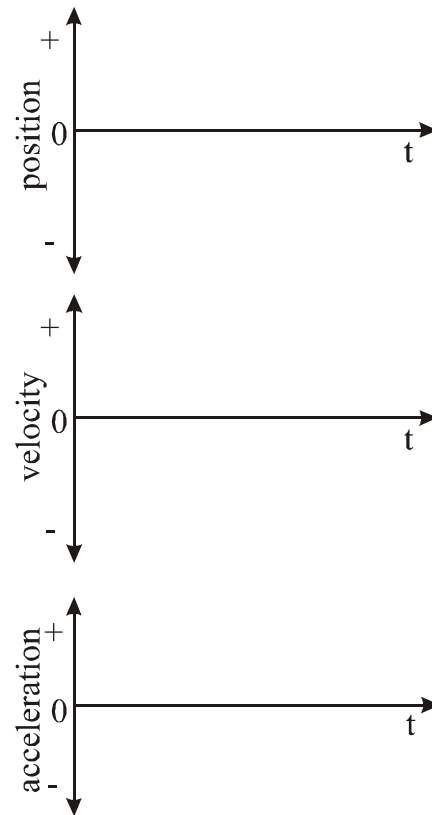
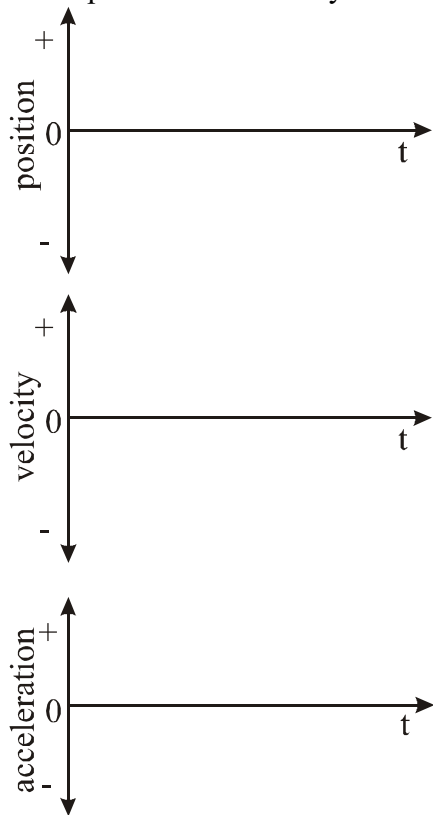
b. Draw a motion map including both velocity and acceleration vectors.

c. Is the velocity positive or negative?  
Does the direction of the velocity change?  
Is position A positive or negative?

d. Is the acceleration positive or negative?  
Does the direction of the acceleration change?  
Is position B positive or negative?

e. Predict the graphs describing the motion. Label points A and B on your x-t graph.

f. Record the graphs as displayed by the motion detector.



g. On the observed graphs, describe the slope as  
a) constant, increasing or decreasing  
b) positive or negative  
c) state what the slope represents

*Note: You may have to divide your graph into segments.*