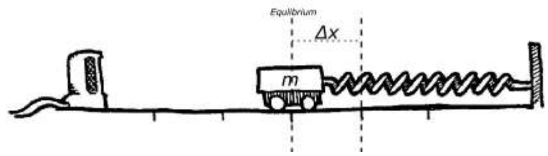
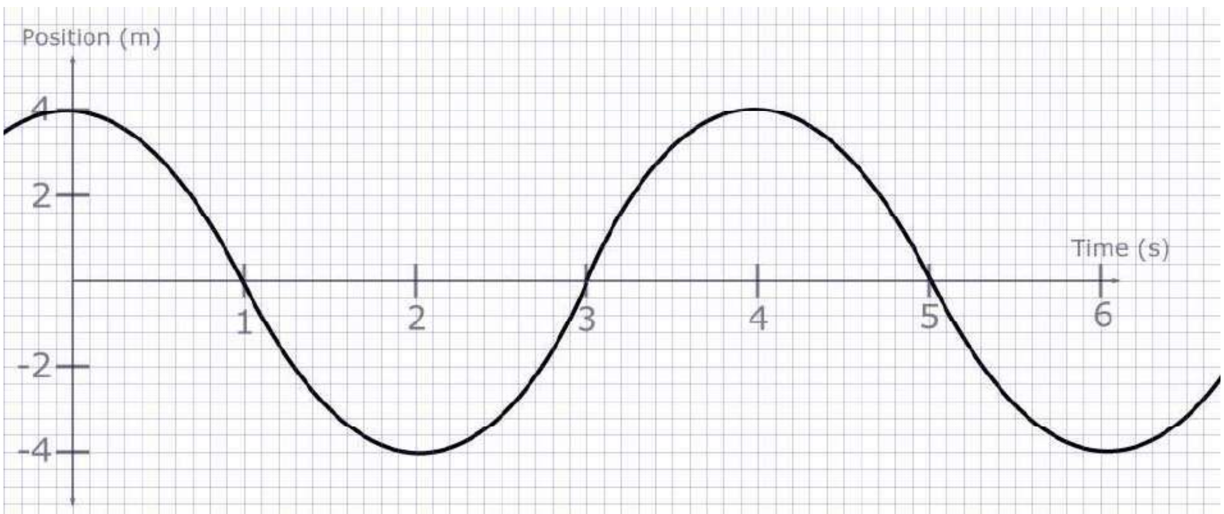
NAME ______________________________ DATE ______________

Scenario

A cart of mass m, resting on a smooth surface, is attached to an ideal spring. The cart is displaced to the right a distance Δx from equilibrium and released. While the cart oscillates around the equilibrium position, a motion detector collects data to make the following graph of position as a function of time.





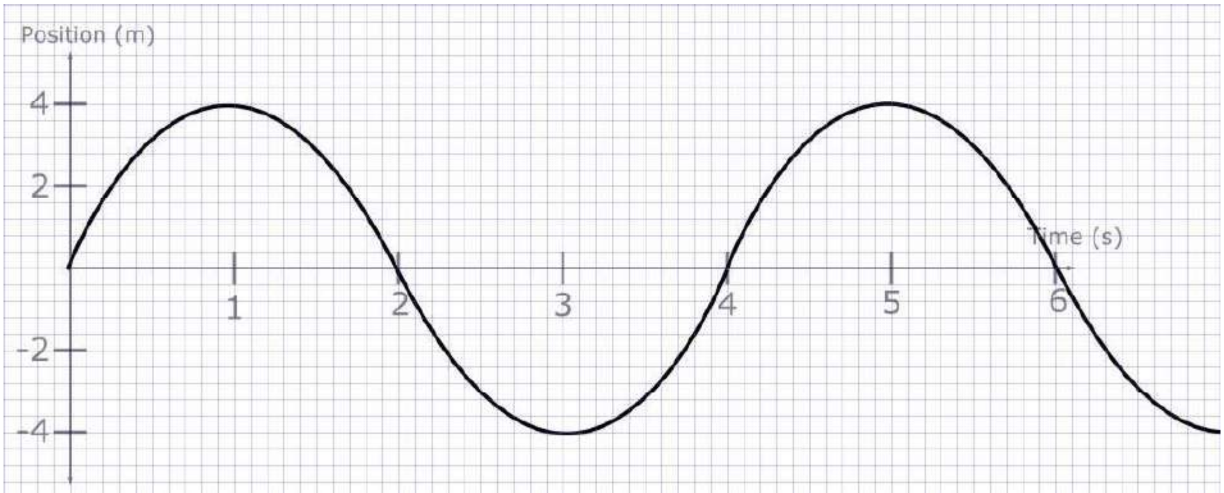
Data Analysis

PART A: Using the graph above, determine the following:

T	*f*	*ω*	*Time(s) of maximum positive velocity*	*Time(s) of maximum negative velocity*	*Time(s) when velocity is zero*	*Time(s) of maximum positive acceleration*	*Time(s) of maximum negative acceleration*	*Time(s) when acceleration is zero*

PART B: Remember from math class that the equation to describe a cosine wave is $x = A\cos(2\pi ft)$, where A is the amplitude, f is the frequency, and x is the position as a function of time t. In terms of the data you collected in Part A, write the equation for the position of the cart as a function of time.

$x =$ ______________________________



PART C: Another group of students collected the following data from their motion sensor. What is one possible explanation for the differences in the graphs created by the two groups?

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PART D: Write the equation that describes the position vs. time of the second group's cart.

$x =$ ______________________

Using Representations

PART E: The second group repeated their procedure thinking that perhaps if they added mass to the cart, it would help their analysis. On the graph in Part C above, sketch what the position vs. time graph would look like for a cart with a mass of $4m$.