

Engineering Models I Homework Assignment #4

Instructions:

1. **Show your work!**
2. It is fine to work with other students, but what you turn in must be your own work - not something copied from someone else.

Problem 1: The table below shows the velocity of an object in increments of 0.5 seconds.

t (seconds)	velocity (cm/s)
0	9
0.5	9.25
1.0	10
1.5	11.25

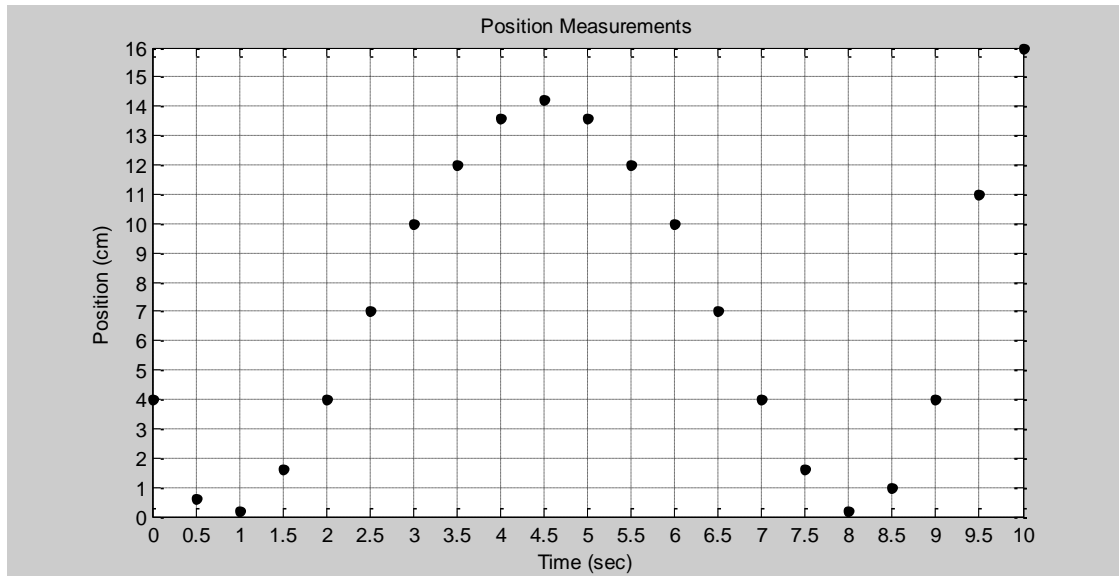
- (a) Using the data provided, estimate the velocity of the object at 0.825 seconds using *nearest point* interpolation.
- (b) Using the data provided estimate the velocity of the object at 0.825 seconds using *linear* interpolation. Do this part by hand (don't use *interp1*) and show your calculations.
- (c) Suppose we wish to *insert 3* new data points (evenly spaced in time, t) between each adjacent set of points in the table. What would the new increment for t be?
- (d) Calculate the *three* new data points between t = 0.5 and t = 1.0 in the table below using *linear interpolation*. OK to use *interp1* for this. Show your calculations or MATLAB command to get these three points.

t	velocity (cm/s)
0.5	9.25
1.0	10

Problem 2: The graph on the following page shows the position of an object in increments of 0.5 seconds.

- (a) Using *linear interpolation*, estimate the position of the object at 6.85 seconds. Do this by hand (no *interp1*) and show your calculations.
- (b) Now use *interp1* and linear interpolation to estimate the position of the object at 6.6, 6.7, 6.8, and 6.9 seconds.

MATLAB Command and Results:



Problem 3: For this problem, you need the excel file, HW4_PB3.xlsx posted on the Blackboard metasite under Assignments, HW#4. The excel file has a vector of times, Time, which starts at 0 increments by 0.05 and ends at 1 second. It also has a vector of voltage measurements, Voltage, corresponding to the given times. Import both columns into MATLAB using the import tool or the xlsread command.

- (a) Use *interp1* with a method of *nearest* to estimate the voltage every 0.001 seconds between 0 and 1 second. On the same plot (not subplot), plot the original data points as red circles and the interpolated data points as black points.

MATLAB Commands and Plot

- (b) Use *interp1* with a method of *linear* to estimate the voltage every 0.001 seconds between 0 and 1 second. On the same plot (not subplot), plot the original data points as red circles and the interpolated data points as black points.

MATLAB Commands and Plot

- (c) Use *interp1* with a method of *spline* to estimate the voltage every 0.001 seconds between 0 and 1 second. On the same plot (not subplot), plot the original data points as red circles and the interpolated data points as black points.

MATLAB Commands and Plot

- (d) What kind of waveform does your plot in part (c) look like? Could you possibly have picked this up from looking at the original data points?