**Spring14**

# BIL108E Introduction to Scientific and Engineering Computing

## Homework 4

**Attention**: Please be aware that the Deadline for Homework4 is 27/04/14 until 11.00 pm. Late submissions will not be accepted.

Note: 1.The solution of each question must be prepared separately as .m file and submitted via Ninova as a single folder in "*.zip" or "*.rar" extension (For example; SQ1.m and SQ2.m).
Note: 2.Using comment "%" operator, please explain your solutions.

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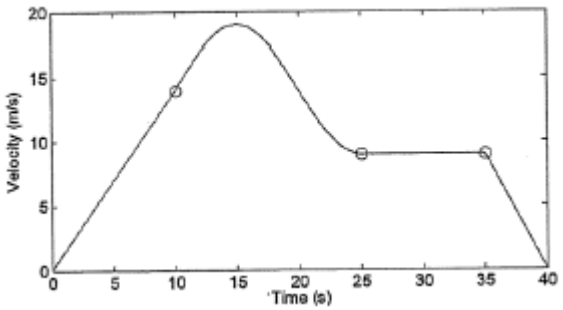
**1. (50 points)** The velocity, as a function of time of a particle that moves along a straight line, is shown and given equations below.




$$v(x)=\begin{cases} 1.4t & \text{for} \quad 0\le t\le 10\ \text{s} \\ 14+5\sin\left(\frac{\pi}{10}(t-10)\right) & \text{for} \quad 10\le t\le 25\ \text{s} \\ 9 & \text{for} \quad 25\le t\le 35\ \text{s} \\ 9-\frac{9}{5}(t-35) & \text{for} \quad 35\le t\le 40\ \text{s} \end{cases}$$

Write two user-defined functions: One that calculates the velocity of the particle at time t (for the function name and arguments use v = velocity(t)), and the other that calculates the acceleration of the particle at time t (for the function name and arguments use a = acceleration(t)).

**2. (50 points)** Determine the appropriate function for the data given below using linear and power function with their coefficients (Hint. Least Square Regression).

| x | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
|---|---|---|---|---|---|---|---|---|---|
| y | 5 | 115 | 245 | 367 | 548 | 700 | 985 | 1125 | 1345 |

Compare the function's goodness of fit by calculating a quantity called the root mean square (RMS) error which is defined by the following equation;

$$\text{RMS error} = \sqrt{\sum_{i=1}^{n}\left(\frac{Ei-Ai}{n}\right)^2}$$

Where $E_i$ are the exact values, $A_i$ are the predictions or approximations of the model, and n is the total number of data points.