Homework Assignment #13   Due 9:00 am Apr 20(F) 2018

Read Chapter 14 in the book.

Problem 13.1

Analyzing electric circuits can be accomplished by solving sets of equations. For a particular circuit, the voltages V_1, V_2, and V_3 are found through the following linear equations:

$V_1 = 5$

$-6V_1 + 10V_2\text{-}3V_3 = 0$

$-V_2+51V_3 = 0$

Write a MATLAB program to solve for the voltages. Show your program and results.

Problem 13.2

An electrical circuits with time-varying sources is being analyzed to follow the following equations.

$2(Va\text{-}Vb) + 5(Va\text{-}Vc) - e^{-t} = 0$

$2(Vb - Va) + 2Vb + 3(Vb - Vc) = 0$

$Vc = 2 \sin(t)$

Write a MATLAB program to use the *solve* function to solve for the three voltages, Va, Vb, and Vc, each is a function of time (t). Show your program and results.

Problem 13.3

An object starts to move at time 0, and its velocity is measured at a sequence of time as below. Write and run a MATLAB program that determine and plot its distance from its initial position at t=0 over this time period, the velocity versus time, and the acceleration versus time using subplot(3, 1, n). Use the time interval from 0 to 10s for all the plots. Use the central difference technique to compute the acceleration and use the **stairs** for the acceleration versus time curve. Show your program and curves.

Time (s)   0 1 2 3 4 5 6 7 8 9 10

Vel (m/s)   0 3 7 12 15 12 8 6 1 -2 -8

Problem 13.4

Write one program to find the following for the function $4x^2 + 3$.

 (1) Find the indefinite integral of the function using the symbolic *int* function.
 (2) Find the definite integral of this function from x=-1 to x=3 using the symbolic *int* function.
 (3) Find the definite integral of this function from x = -1 to x = 3 using the *trapz* function with 100 evenly spaced data points.
 (4) Find the definite integral of this function from x = -1 to x = 3 using the *integral* function.

Show your program and results. Compare the results in (3) and (4), which one is more accurate? Why?

Problem 13.5

Write a MATLAB program to solve the following problem

The temperature (in degrees Fahrenheit) was recorded every 3 hours for a day at a particular location. Using a 24 hour clock where midnight is 0, the measured data is shown below:

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Time: 0     3     6     9     12    15    18    21
Temp: 55.5 52.4 52.6  55.7  75.6  77.7  70.3  66.6
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 1. plot the data points as black circles
 2. plot linear inter/extrapolation of the temperature using blue dashed line and spline inter/extrapolation using red dot-dashed line, in the same figure window as that in 1.
 3. find the temperature at 10:30am and 11:00pm during the day from both curves in 2, and plot the points in the figure as blue squares(for linear) and red stars(for spline), respectively.
 4. in a new figure window, repeat 1, curve-fitting the data with a third-order polynomial, plot the smooth fitted curve as blue dashed line, and a fifth-order polynomial plotted in red dot dashed line.
 5. find the time during the day when temperature is 60 and 65 degree, from both polynomials in 4, and plot those points in the figure as blue squares(for 3rd order) and red stars(5th order).

Properly label and title your figures, use legends if necessary.