CE5310 Numerical Methods

Homework #02 Solution

Complete the homework using MATLAB and copy and paste the commands and results from the command window into your homework problem statement, given find solution format (I'd use MSWord).

Example Assignment

1) ***Problem Statement***

Find the acceleration that is possible with the power output from a spacecraft power generators.

Given

Mass = 721.9 kg
Power = 335 watts = 225 J/s
Velocity = 3.50 AU/year (Voyager 1)
Velocity = 3.15 AU/year (Voyager 2)

Find

Acceleration of each spacecraft, in m/sec

Solution

```
>> mass=721.9;
>> power=335;
>> velocity=[3.5 3.15];
>> velocity=velocity*150e9/365/24/3600;
>> acceleration=power./(mass.*velocity)

acceleration =

  1.0e-004 *

    0.2788    0.3097

>>
```

Under the Additional References Chapter 2 in Section 2.6 work problems 28, 30

1. Plot the variation of air and water viscosity with temperature from the data that follow. Which function, plot, semilogy, or loglog, creates the "best " plot? Why?.

T °C	μ_{air} kg/(m·s)	T °C	μ_{H_2O} kg/(m·s)
0	1.720×10^{-5}	2	1.652×10^{-3}
20	1.817×10^{-5}	22	9.590×10^{-4}
40	1.911×10^{-5}	42	6.310×10^{-4}
60	2.002×10^{-5}	62	4.530×10^{-4}
80	2.091×10^{-5}	87	3.240×10^{-4}
100	2.177×10^{-5}	107	2.600×10^{-4}
127	2.294×10^{-5}	127	2.170×10^{-4}
177	2.493×10^{-5}	177	1.520×10^{-4}
227	2.701×10^{-5}	227	1.180×10^{-4}

2. Data in the table that follows were obtained from an experiment in which the theoretical model is $y = 5xe^{-3x}$. The xm and ym values were measured, and the dy values were obtained from an uncertainty analysis. Use the built-in errorbar function to create a plot of the experimental data with the error bars. Use the hold on and plot functions to overlay a plot of the measured data with the theoretical model.

x_m	0.010	0.223	0.507	0.740	1.010	1.220	1.530	1.742	2.100
y_m	0.102	0.620	0.582	0.409	0.312	0.187	0.122	0.081	0.009
δ_y	0.0053	0.0490	0.0671	0.0080	0.0383	0.0067	0.0417	0.0687	0.0589

