EE432 Fall 08 Homework Problem Set 3 (PS03) SOLUTIONS

1. MATLAB text, problem 6.14. You will need the file called: elements.dat .

```
% Part a: User inputs
mw_oxygen = 15.9994;
mw_carbon = 12.001;
mw_nitrogen = 14.00674;
mw_sulfer = 32.066;
mw_hydrogen = 1.00794;
molecular_wts = [mw_oxygen mw_carbon mw_nitrogen mw_sulfer mw_hydrogen];
No=input('Number of oxygen atoms: ');
Nc=input('Number of carbon atoms: ');
Nn=input('Number of nitrogen atoms: ');
Ns=input('Number of sulfer atoms: ');
Nh=input('Number of hydrogen atoms: ');
molecules = [No Nc Nn Ns Nh];
molecular_wt = molecular_wts * molecules';
% note: the ' gives the transpose of molecules, so we are multiplying a 1x5
% vector times a 5x1 vector, which gives a 1x1 result (i.e., a single
% value)
fprintf('Your molecular weight is %5.2f\n',molecular_wt);
```

Will result in the following to be displayed (with the inputs I show below):

```
Number of oxygen atoms: 2
Number of carbon atoms: 3
Number of nitrogen atoms: 4
Number of sulfer atoms: 5
Number of hydrogen atoms: 6
Your molecular weight is 290.41
```

```
% Part b: using elements.dat
load elements.dat -ascii
weights = elements * molecular_wts';
% note: the ' gives the transpose of molecular_wts, so we are multiplying a
% 20x5 matrix by a vector that is 5x1 vector, which gives a 20x1 result
% (which is the molecular weights of the 20 amino acids).
save weights.dat weights -ascii
```

Will result in the following values for weights:

```
weights =
```

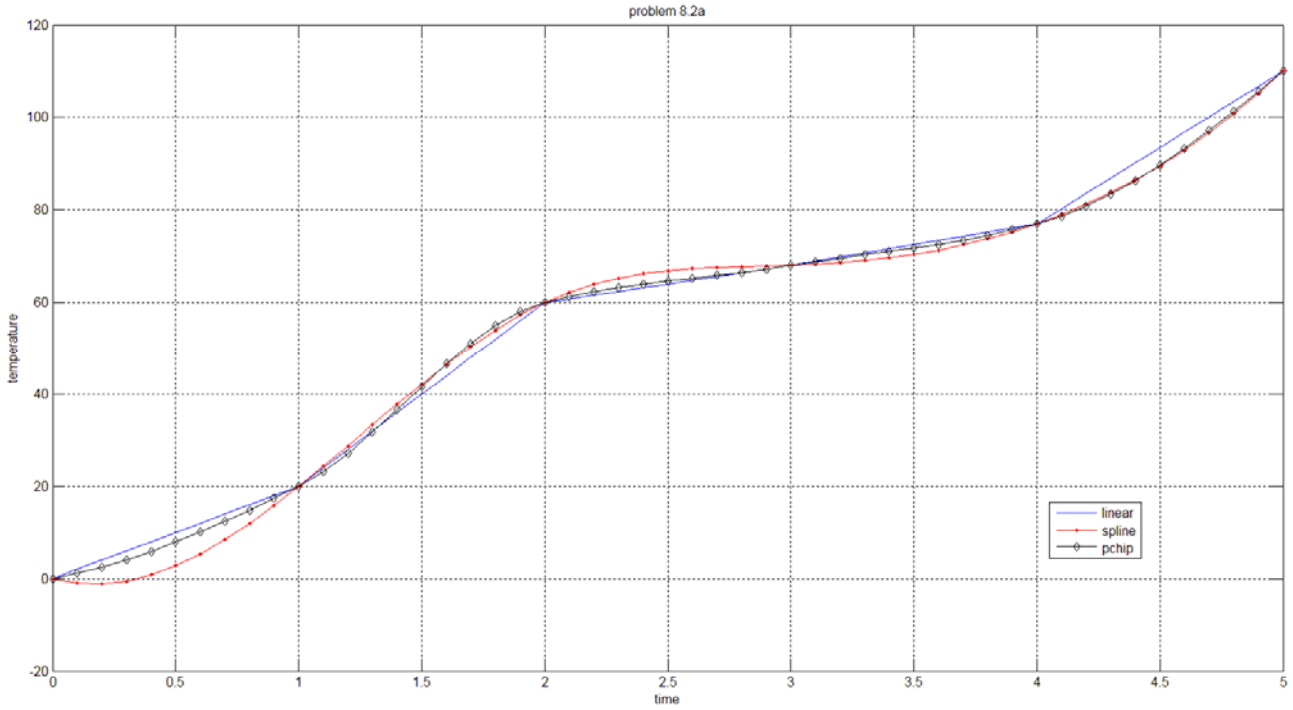
```
89.0641
175.1509
132.0792
132.0560
121.1301
146.0729
146.0961
75.0472
156.1044
131.1148
131.1148
147.1374
149.1639
165.1019
116.0899
105.0635
119.0804
203.1106
469.6953
117.0979
```

2. Text, problem 8.2:

```
% ps04, problem 8.2
%
t=0:1:5;
T=[0 20 60 68 77 110];

ti=0:0.1:5;
Tlinear=interp1(t,T,ti,'linear');
Tspline=interp1(t,T,ti,'spline');     % 'spline' = cubic spline
Tpchip=interp1(t,T,ti,'pchip');
figure(1),plot(ti,Tlinear,ti,Tspline,'r.-',ti,Tpchip,'-kd');
xlabel('time'),ylabel('temperature'),title('problem 8.2a')
legend('linear','spline','pchip'),grid on

diff1=abs(Tlinear-Tspline);
diff2=abs(Tlinear-Tpchip);

maxdiff1=max(diff1);,maxdiff2=max(diff2);
if maxdiff1 > maxdiff2
    tmax=ti(find(diff1==maxdiff1));
    fprintf('Max diff is %f and occurs at time t=%f sec\n',maxdiff1,tmax)
else
    tmax=ti(find(diff2==maxdiff2));
    fprintf('Max diff is %f and occurs at time t=%f sec\n',maxdiff1,tmax)
end
```

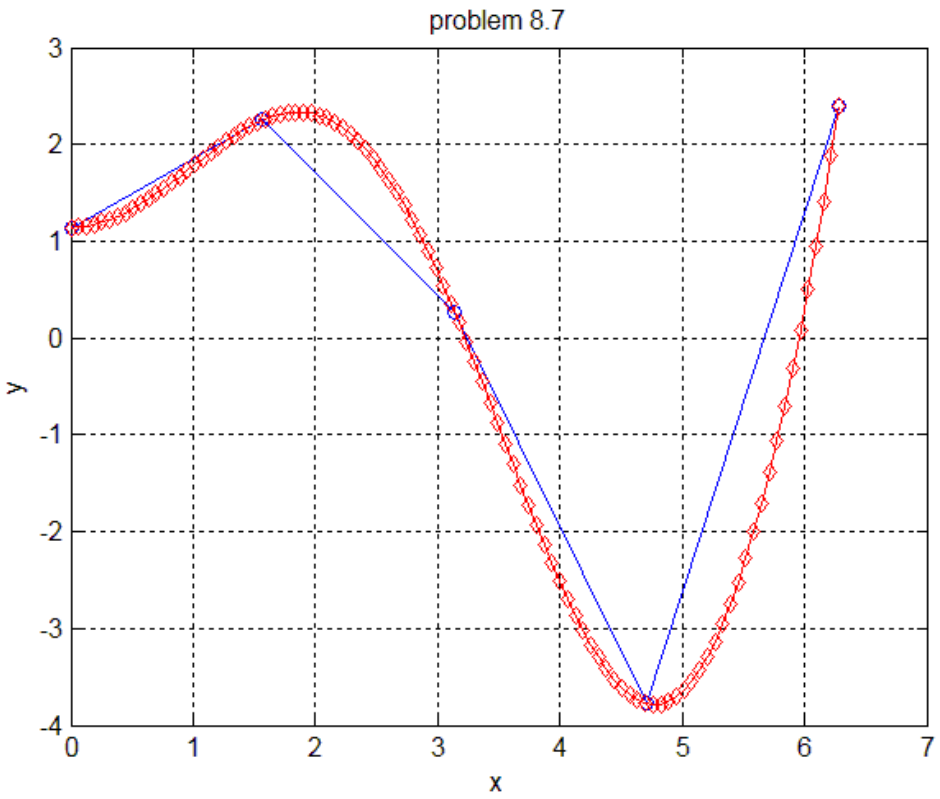
Results in the following figure and text on the command line:

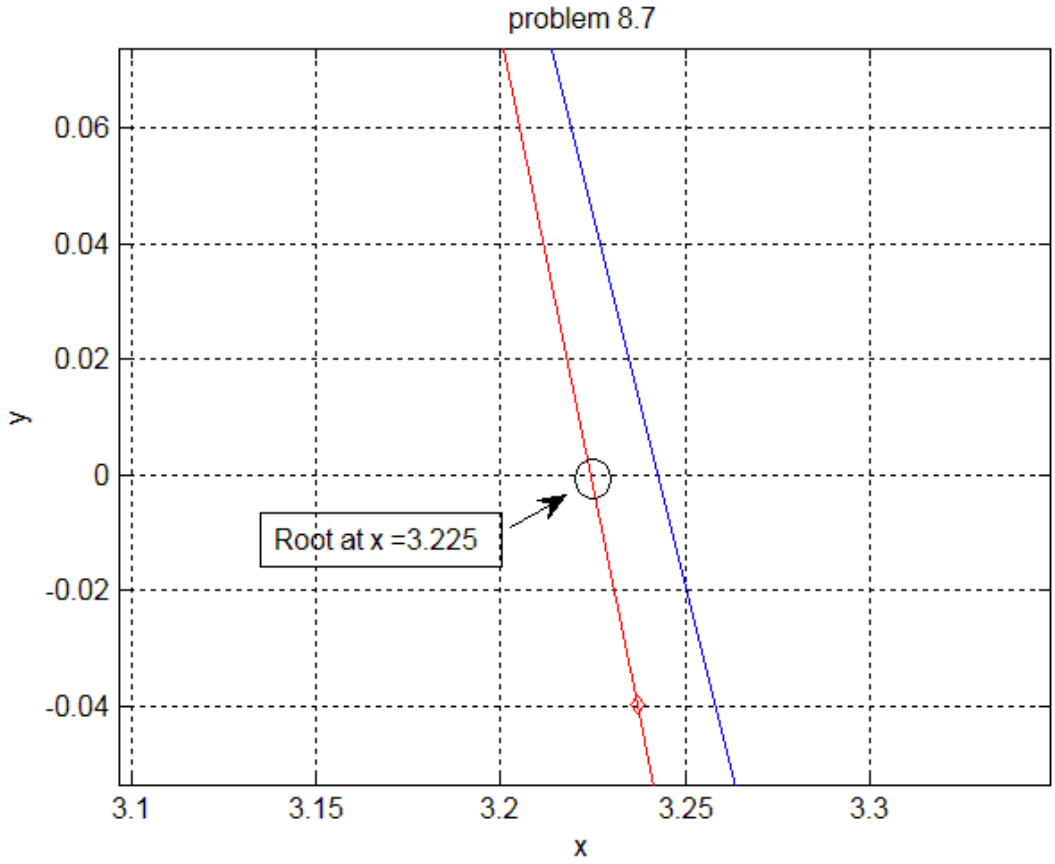
```
Max diff is 7.221333 and occurs at time t=0.400000 sec
```



3. Text, problem 8.7:

```
% ps04, problem 8.7
n=5;
x=linspace(0,2*pi,n);
y=x.*sin(x) + cos(1/2*x).^2 - 1./(x-7);
plot(x,y,'-o')
hold on, grid on

n=100;
x=linspace(0,2*pi,n);
y=x.*sin(x) + cos(1/2*x).^2 - 1./(x-7);
plot(x,y,'r-d'),xlabel('x'),ylabel('y'),title('problem 8.7')
```


problem 8.7
3
2
1
0
-1
-2
-3
-4
y
0
1
2
3
4
5
6
7
x


problem 8.7
0.06
0.04
0.02
0
-0.02
-0.04
y
Root at x =3.225
3.1
3.15
3.2
3.25
3.3
x