ASE 211 Homework 10

Due: Friday, April 7 at 12:00 p.m.

1. Consider the following data:

x_i	f_i
0	0
.1	.0309
.2	.1176
.3	.2427
.4	.3804
.5	.5

Using a divided difference table, construct the Lagrange polynomial that interpolates the data. Use the Lagrange polynomial to compute approximations to $f'(.25)$ and $f''(.25)$. The data is from the function $x\sin(\pi x)$. Compare the approximations to the first and second derivatives with their actual values.

2. A rocket's distance traveled along its trajectory is measured, giving the following data:

time (sec)	distance (m)
0	0
1	25
2	65
3	140
4	275
5	444
6	621
7	899
8	1244
9	1680

Write a matlab program which constructs a divided difference table of the data, builds a Lagrange polynomial and differentiates the polynomial once. Use your program to determine the velocity of the rocket at t=7.4 seconds. The following m-file may be of use. It differentiates the polynomial

$$(x - x_1)(x - x_2) \cdots (x - x_k)$$

and evaluates it at $x = t$.

```
function [d]=pderiv(x,k,t)
```

```
d=0;
for j=1:k
  prod=1;
  for i=1:k
     if (i~=j) prod=prod*(t-x(i));
     end
  end
  d=d+prod;
end
```