數值方法_作業三_陳政謙 E14101082

1. Use the Lagrange interpolating polynomials of degree one, two, three and four to approximate $\cos(0.750) = 0.7317$ if $\cos(0.698) = 0.7661$, $\cos(0.733) = 0.7432$, $\cos(0.768) = 0.7193$, $\cos(0.803) = 0.6946$.

   Find the error bound.

```
PS C:\Users\user\Desktop\numerical_hw3> cd "c:\Users\user\Desktop\numerical_h
Degree 1 Approximation: 0.732077
Degree 1 Error Bound: 0.000301284
Degree 2 Approximation: 0.731716
Degree 2 Error Bound: 1.80771e-006
Degree 3 Approximation: 0.731704
Degree 3 Error Bound: 2.39521e-008
Degree 4 Approximation: 0.731689
Degree 4 Error Bound: 0
PS C:\Users\user\Desktop\numerical_hw3>
```

2. Use iterated inverse interpolation to find an approximation to the solution $x - e^{-x} = 0$ using the data $e^{-0.3} = 0.740818$, $e^{-0.4} = 0.670320$, $e^{-0.5} = 0.606531$, $e^{-0.6} = 0.548812$.

```
PS C:\Users\user\Desktop> cd "c:\Users\user\Desktop\numer
x: 0.56714893
PS C:\Users\user\Desktop\numerical_hw3>
```

3. A car travelling along a straight road is clocked at a number of points. The data from the observations are given in the following table, where the time T is in seconds, the distance D is in feet, and the speed V is in feet per second.

T	0	3	5	8	13
D	0	200	375	620	990
V	75	77	80	74	72

   a. Use a Hermite polynomial to predict the position of the car and its speed when $t = 10$ s.

   b. Use the derivative of the Hermite polynomial to determine whether the car ever exceeds a 55 mi/h speed limit on the road. If so, what is the first time the car exceeds this speed?

   c. What is the predicted maximum speed for the car ?

```
PS C:\Users\user\Desktop\numerical_hw3> cd "c:\Users\user\Desktop\numerical_
(a) At t=10 seconds:
    Position H(10) = 596.316006 ft
    Speed   H'(10) = -100.717641 ft/s

(b) Speed first exceeds 80.6 ft/s at t = 0.032026 seconds.

(c) Max speed = 398.204129 ft/s at t = 12.411165 s ( = 271.502743 mph)
```