Homework Feedback 8

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**P. 140 #7** A car traveling 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 is in seconds, the distance is in

feet. and the speed is in feet per second.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Time | 0 | 3 | 5 | 8 | 13 |
| Distance | 0 | 225 | 383 | 623 | 993 |
| Speed | 75 | 77 | 80 | 74 | 72 |

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

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?

**Answer:** Obviously, the distance is value of the function with respect to time and speed is the *derivative* of the function with respect to time, which is the two types of inputs required in Hermite interpolation with help of Lagrange polynomial.

1. Given 5 data points and 5 derivatives, we need to construct 9-th order Hermite polynomials:

+   
b. , Note when times are 8,13, the speeds are 74, 72. Therefore, we need carefully check the speed value from the 9-th order polynomial.

c. x 5.6488092

d. The maximum speed is the maximum value of

**P.153 #9** A natural cubic spline S is defined by:

If S interpolates the data (1,1), (2,1) and (3,0), find B,D,b and d.

**Answer:** For a natural spline, the two cubic splines share same function value and first and second derivative values at common points.

Therefore， , b = , d =

**Typical errors:**

Thesecond order derivative of :

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**P. 154 #17** Given the partition of [0,0.1], find the piecewise linear

interpolating function F for . Approximate with , and

compare the results to the actual value.

**Answer:** First, we calculate . Therefore, the piecewise linear interpolating function is:

Integrate the function F(x) and , we have:

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