

1132_數值方法 Numerical Method

HW3

Use Matlab

Q1

$$x_0 = 0.698, x_1 = 0.733, x_2 = 0.768, x_3 = 0.803$$

$$y_0 = 0.7661, y_1 = 0.7432, y_2 = 0.7193, y_3 = 0.6946$$

Degree 1 Approximation:

i, j	L0	L1	y_tar	Error Bound

0, 1	-0.485714	1.485714	0.732077	0.000442
0, 2	0.257143	0.742857	0.731334	0.000468
0, 3	0.504762	0.495238	0.730690	0.001378
1, 2	0.514286	0.485714	0.731591	0.000153
1, 3	0.757143	0.242857	0.731397	0.000451
2, 3	1.514286	-0.514286	0.732003	0.000477

Degree 2 Approximation:

i, j, k	L0	L1	L2	y_tar	Error Bound

0, 1, 2	-0.124898	0.764082	0.360816	0.731716	0.000003
0, 1, 3	-0.245170	1.124898	0.120272	0.731740	0.000008
0, 2, 3	0.129796	1.124898	-0.254694	0.731665	0.000008
1, 2, 3	0.389388	0.735510	-0.124898	0.731691	0.000003

Degree 3 Approximation:

i, j, k, m	L0	L1	L2	L3	y_tar	Error Bound

0, 1, 2, 3	-0.063044	0.578519	0.546379	-0.061854	0.731704	0.000000

題目給定 4 個點，故 degree four approximation 無法計算

Q2

Approximate root: $x \approx 0.567143$

Q3

使用課本的方法計算：

使用題目給定的 5 點數據：

- (a) Predicted Position at $t = 10.00$ s: 596.32 ft
Predicted Speed at $t = 10.00$ s: 70.71 ft/s
- (b) The car first exceeds 55 mi/h at $t = 0.04$ s
- (c) The predicted maximum speed is 398.20 ft/s at $t = 12.41$ s

使用題目給定的末 4 點數據：

- (a) Predicted Position at $t = 10.00$ s: 727.87 ft
Predicted Speed at $t = 10.00$ s: 79.76 ft/s
- (b) The car first exceeds 55 mi/h at $t = 3.07$ s
- (c) The predicted maximum speed is 125.21 ft/s at $t = 12.30$ s

使用題目給定的末 3 點數據：

- (a) Predicted Position at $t = 10.00$ s: 762.22 ft
Predicted Speed at $t = 10.00$ s: 75.73 ft/s
- (b) The car first exceeds 55 mi/h at $t = 5.05$ s
- (c) The predicted maximum speed is 85.64 ft/s at $t = 5.88$ s

使用 pchip 函數進行計算：

- (a) Predicted position at $t = 10$ s: 773.15 feet
Predicted speed at $t = 10$ s: 72.79 feet/sec
- (b) Car never exceeds 55 mph.
- (c) Predicted maximum speed: 80.00 feet/sec at $t = 4.99$ seconds