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
-------------------------------------------------
0, 1     -0.485714   1.485714    0.732077
0, 2     0.257143    0.742857    0.731334
0, 3     0.504762    0.495238    0.730690
1, 2     0.514286    0.485714    0.731591
1, 3     0.757143    0.242857    0.731397
2, 3     1.514286    -0.514286   0.732003

Degree 2 Approximation:
i, j, k  L0          L1          L2          y_tar
-------------------------------------------------------------
0, 1, 2  -0.124898   0.764082    0.360816    0.731716
0, 1, 3  -0.245170   1.124898    0.120272    0.731740
0, 2, 3  0.129796    1.124898    -0.254694   0.731665
1, 2, 3  0.389388    0.735510    -0.124898   0.731691

Degree 3 Approximation:
i, j, k, m   L0          L1          L2          L3          y_tar
-----------------------------------------------------------------------------
0, 1, 2, 3   -0.063044   0.578519    0.546379    -0.061854   0.731704
```

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

Q2

```
Approximate root: x ≈ 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 = 10s: 773.15 feet
    Predicted speed at t = 10s: 72.79 feet/sec
(b) Car never exceeds 55 mph.
(c) Predicted maximum speed: 80.00 feet/sec at t = 4.99 seconds
```