答案

1.

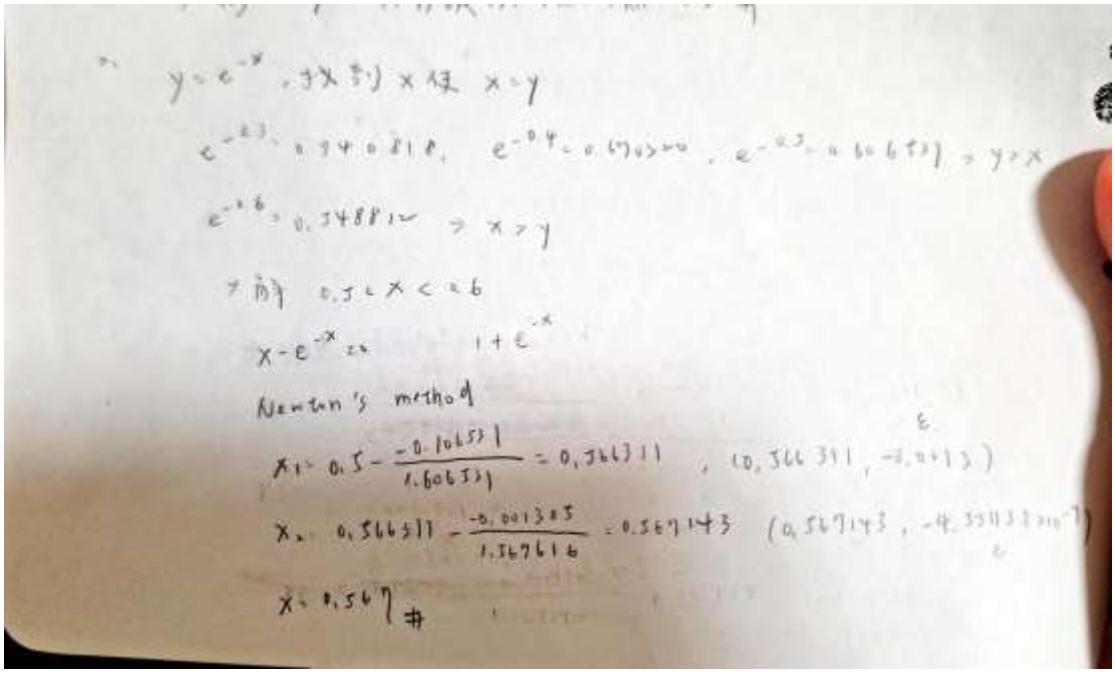
```
C:\Users\user\Desktop\新文件1.exe
使用 1 階 Lagrange 多項式:
  近似 cos(0.750) = 0.73207714286
  誤差界估計值: 0.00044200000
  真實誤差: 0.00037714286

使用 2 階 Lagrange 多項式:
  近似 cos(0.750) = 0.73171632653
  誤差界估計值: 0.00000265200
  真實誤差: 0.00001632653

使用 3 階 Lagrange 多項式:
  近似 cos(0.750) = 0.73170395569
  誤差界估計值: 0.00000003514
  真實誤差: 0.00000395569

  degree 4:只有提供4點，無法求
--------------------------------
Process exited after 0.157 seconds with return value 0
請按任意鍵繼續 . . .
```

2.



3.

main.py

```python
import numpy as np
from scipy.interpolate import CubicHermiteSpline

# 已知數據點
time_points = np.array([0, 3, 5, 8, 13])
distance_points = np.array([0, 200, 375, 620, 990])
velocity_points = np.array([75, 77, 80, 74, 72])

# 建立 Hermite 插值樣條函數
spline = CubicHermiteSpline(time_points, distance_points, velocity_points)
velocity_spline = spline.derivative()  # 速度函數

# (a) 預測 t = 10 秒時的位置與速度
time_query = 10
position_at_t = spline(time_query)
speed_at_t = velocity_spline(time_query)

# (b) 找出何時速度超過 80.67 ft/s (55 mi/h)
threshold_speed = 80.67
times_fine = np.linspace(time_points[0], time_points[-1], 1000)
```

input

```
(a) t = 10s: 位置 = 768.96 ft, 速度 = 74.64 ft/s
(b) 車輛首次超過 55 mi/h (80.67 ft/s) 的時間: t = 3.14 s
(c) 最大速度 = 92.04 ft/s,在 t = 4.05 s


nished with exit code 0
```