數值方法 HW4

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Q1_a:

```
chenyian@chenyiandeMacBook-Air-2 F54091196_numerical_hw4 % /opt/homebrew/bin/python3 /Users/chenyian/Desktop/F54091196_nu
merical_hw4/question1_a.py
The value using trapezoidal rule is: 0.39614759221490103
```

Q1_b:

```
chenyian@chenyiandeMacBook-Air-2 F54091196_numerical_hw4 % /opt/homebrew/bin/python3 /Users/chenyian/Desktop/
F54091196_numerical_hw4/question1_b.py
The value using simpson rule is: 0.3856635960237445
```

Q1_c:

```
chenyian@chenyiandeMacBook-Air-2 F54091196_numerical_hw4 % /opt/homebrew/bin/python3 /Users/chenyian/Desktop/F54091196_n
merical_hw4/question1_c.py
The value using midpoint rule is: 0.36469560364143166
```

Q2:

```
chenyian@chenyiandeMacBook-Air-2 F54091196_numerical_hw4 % /opt/homebrew/bin/python3 /Users/chenyian/Desktop/F54091196_nu
merical_hw4/question2.py
/Users/chenyian/Desktop/F54091196_numerical_hw4/question2.py:3: DeprecationWarning: Please use `p_roots` from the `scipy.
special` namespace, the `scipy.special.orthogonal` namespace is deprecated.
  from scipy.special.orthogonal import p_roots
The value using Gaussian Quadrature with 3 is: 0.19225937725687903
The value using Gaussian Quadrature with 4 is: 0.1922593578048632
```

Q3:

```
chenyian@chenyiandeMacBook-Air-2 F54091196_numerical_hw4 % /opt/homebrew/bin/python3 /Users/chenyian/Desktop/F54091196_nu
merical_hw4/question3.py
a) Composite Simpson's rule result = 0.5119875440121252
b) Gaussian quadrature result = 0.5118655399516701
c) Exact value = 0.5118446353109125
c) error bound between simpson and exact = 0.00014290870121269617
c) error bound between gauss and exact = 2.090464075754639e-05
```

Q4_a:

```
chenyian@chenyiandeMacBook-Air-2 F54091196_numerical_hw4 % /opt/homebrew/bin/python3 /Users/chenyian/Desktop/F54091196_nu
merical_hw4/question4_a.py
The value using composite Simpson's rule with n=4 is 0.5245906509751541
```

Q4_b:

```
chenyian@chenyiandeMacBook-Air-2 F54091196_numerical_hw4 % /opt/homebrew/bin/python3 /Users/chenyian/Desktop/F54091196_nu
merical_hw4/question4_b.py
The value using composite Simpson's rule with n=4 is 0.2744816193780423
```