數值方法作業四

1. Determine the values $\int_1^2 e^x \sin(4x)\,dx$ with $h=0.1$ by

a. Use the composite trapezoidal rule

b. Use the composite Simpsons' method

c. Use the composite midpoint rule

```
C:\Users\user\Desktop\Tkinter-Designer-master\ven
Composite Trapezoidal Rule: 0.3961475922149011
Composite Simpson's Rule: 0.38566359602374456
Composite Midpoint Rule: 0.38080479837729303
```

2. Approximate $\int_1^{1.5} x^2 \ln x\,dx$ using Gaussian Quadrature with $n=3$ and $n=4$. Then compare the result to the exact value of the integral.

```
C:\Users\user\Desktop\Tkinter-Designer-master\venv\Scripts\python.exe C:\Users\
Gaussian Quadrature (n=3): 0.19225937725687903 %err =  1.0155075528939589e-05
Gaussian Quadrature (n=4): 0.1922593578048632 %err =  3.748434336138312e-08
Exact Value: 0.19225935773279604
```

3. Approximate $\int_0^{\pi/4} \int_{\sin x}^{\cos x} (2y\sin x + \cos^2 x)\,dydx$ using

a. Simpson's rule for $n=4$ and $m=4$

b. Gaussian Quadrature, $n=3$ and $m=3$

c. Compare these results with the exact value.

```
C:\Users\user\Desktop\Tkinter-Designer-master\venv\Scripts\python.
Simpson's Rule: 0.5119875440121252 %err =  26.69203671787773
Gaussian Quadrature: 0.511865539945296 %err =  26.66184664021818
Exact value: 0.4041197515454243
```

4. Use the composite Simpson's rule and $n=4$ to approximate the improper integral a) $\int_0^1 x^{-1/4}\sin x dx$, b) $\int_1^\infty x^{-4}\sin x dx$ by use the transform $t=x^{-1}$

```
C:\Users\user\Desktop\Tkinter-Desi
Part (a): 0.5259312819330654
Part (b): 0.2744816193780423
```