數值方法_作業四_陳政謙_E14101082

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

```
PS C:\Users\user\Desktop\nuemrical_hw4> cd "c:\Users\user\Desktop\nuemrical_hw4\" ; if
Using n = 10 and h = 0.1
Integral of e^x * sin(4x) from 1.0000000000 to 2.0000000000 with h = 0.1000000000:
a. Composite Trapezoidal Rule Result: 0.3961475922
b. Composite Simpson's Rule Result:   0.3856635960
c. Composite Midpoint Rule Result:    0.3808047984
PS C:\Users\user\Desktop\nuemrical_hw4>
```

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.

```
PS C:\Users\user\Desktop\nuemrical_hw4> cd "c:\U
Gaussian Quadrature (n=3): 0.1922593773
Gaussian Quadrature (n=4): 0.1922593520
Exact Value:               0.1922593577
Error (n=3):               0.0000000195
Error (n=4):               0.0000000058
PS C:\Users\user\Desktop\nuemrical_hw4>
```

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.

```
PS C:\Users\user\Desktop\nuemrical_hw4> cd "c:\Users\user\Deskt
Approximating integral of (2y*sin(x) + cos^2(x)) dy dx
Limits: x from 0 to pi/4, y from sin(x) to cos(x)
--------------------------------------------------
a. Simpson's Rule (n=4, m=4): 0.0537796076
b. Gaussian Quadrature (n=3, m=3):    0.5118655399
c. Exact Value:                        0.5118446353
--------------------------------------------------
Comparison:
   Simpson Error:   0.4580650277
   Gaussian Error:  0.0000209046
PS C:\Users\user\Desktop\nuemrical_hw4>
```

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 $t=x^{-1}$

```
PS C:\Users\user\Desktop\nuemrical_hw4> cd "c:\Users\user\D
Approximate value (a): 0.5259288092
Approximate value (b): 0.2744816127
PS C:\Users\user\Desktop\nuemrical_hw4>
```