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

```
Problem 1:
a. Trapezoidal rule result: 0.3961475922
b. Simpson's rule result: 0.3856635960
c. Midpoint rule result: 0.3808047984
Exact value: 0.3859357293
```

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.

```
Problem 2:
Gaussian quadrature (n=3) result: 0.1436482150
Gaussian quadrature (n=4) result: 0.1436482464
Exact value : 0.1436482466
```

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

```
Problem 3:
a. Simpson's rule (n=4, m=4) result: 0.1252849847
b. Gaussian quadrature (n=3, m=3) result: 0.0833466191
c. Exact value: 0.1250000000
Error (Simpson): 0.0002849847
Error (Gaussian): 0.0416533809
```

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 $t = x^{-1}$

```
Problem 4:
a. ∫_0^1 sin(x) * x^(-1/4) dx = 0.5290497849
   Exact value: 0.5284080812
   Error: 0.0006417037
b. ∫_1^4 sin(x) * x^(-1) dx = 0.8186777635
   Exact value: 0.8121200686
   Error: 0.0065576949
```