Assignment 6

1. Inplement the following algorithms to calculate the integral of a function f from x_0 to x_1 after division of this interval into n equal parts.

   a. Riemann Sum (left or right end-point)
   b. Trapezoidal Rule
   c. Simpson's Rule (for n even)

2. For each of the algorithms above put in a counter to count the number of function computations involved in the calculation.

3. Use the above methods to calculate the value of $\tan^{-1}(1)$ using the integral $\int_0^1 \frac{dx}{1+x^2}$ after division into n parts for $n = 16, 2^{10}$.

4. Modify your program for Simpson's Rule to adaptively increase the number of points to get a better result (Romberg's method). Print the list of intervals and divisions used and count the number of function evaluations.

5. Use the adaptive method to integrate an oscillatory function like $\exp(-x)\cos(5x)$ over the interval $[0,1]$. Compare the result with that obtained by equal-spaced divisions.