Computational Homework 2, due March 14th

Do the following tasks:

1. Write a program based on the composite Simpson's rule (Algorithm 4.1) in order to approximate $\int_a^b f(x)\ dx$ for $n = 2, 2^2, 2^3, 2^4, 2^5$ equal intervals.

2. Test the code on the following functions:

a.

$$\int_0^\pi \sin x\ dx$$

b.

$$\int_0^1 \exp x\ dx$$

c.

$$\int_0^1 \arctan x\ dx$$

3. Calculate the actual errors for each n for all three functions. Compare the errors at each n and give a brief discussion.

Note: Suppose $[a, b] = [0, 4]$. *When* $n = 2$ *(2 equal intervals), this is equivalent to appplying Simpson's rule twice; one on* $[0, 2]$ *and the other on* $[2, 4]$. *When* $n = 4$ *(4 equal intervals), this is equivalent to appplying Simpson's rule four times (on* $[0, 1]$, $[1, 2]$, $[2, 3]$, *and* $[3, 4]$*).*