9th lab Integration (Trapzd & Simpson) *26th* Sep

1. Develop your own code for composite trapezoid and composite Simpson methods.

It can have two functions each for each methods. For example,

```
>>> func(x,a1,a2):
>>>         """
>>>         The integrand, a1 a2 etc are coefficients.
>>>         """
>>>         # caluclate func
>>>         return func
```

One way to calculate the integral is by passing the x-array to the function that estimates it based on the particular rule (trapzd or Simpson).
A better (and more standard) way is to pass the lower and upper limits and the spacing h.

```
>>> def trapzd(x,h):
>>>         """
>>>         X is the array where the function evaluation is done, and h is the spacing
>>>         """
>>>         # It is also possible to calculate the spacing inside the function.
>>>         y = func(x)
>>>         trp = 0.5*(y[0]+y[-1])*h + np.sum(y[1:-2])
>>>         # Make sure the 2nd terms performs the sums as required, I haven't cross checked it
```

Similarly for Simpson's rule.

Evaluate $\int_0^{\pi} dx \ \sin(x)$
Using the above methods. Use *n=4,8,16*, and *1024* and compare the accuracy of the methods.

To compare the accuracy, calculate $\Delta_T = \frac{|T_n - I|}{I}$, where T_n is the result for composite trapezoid with n divisions of the interval and I is the analytical result. Do the same for Simpson's rule also. Plot Δ_T and Δ_S vs n.