

# APMA 4302 Methods - Homework 1

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## Problem 1

A slightly different modification of problem 1.1 from the Beuler textbook.

Modify the code `expx.c` to compute a well-balanced  $N$  term Taylor Polynomial approximation for  $e^x$  for both positive and negative values of  $x$ . The command line should read

```
$ mpiexec -n nP ./expx -x x -N N
```

where  $x$  is the point at which to evaluate  $e^x$ ,  $N$  is the number of terms in the Taylor polynomial, and  $nP$  is the number of processes to use.

The code should have the following properties:

- you should use `PETSC` options handling to read in the command line arguments.
- The Taylor polynomial should be computed in parallel using  $nP$  processes.
- For each process, the work should be roughly  $O(N/nP)$ .
- The code should work for both positive and negative values of  $x$ .
- The answer should be printed out from process 0 only, and should include the relative error compared to the value computed by the `exp()` function from the standard C, in multiples of machine precision.
- You can use the constant `PETSC_MACHINE_EPSILON` to get machine precision.