

# **CSc 30100**

## **Assignment due March 15, 2021**

Calculate the Taylor polynomials centered at 0,

$$T_n(x) = \sum_{k=0}^n \frac{f^{(k)}(0)}{k!} (x)^k,$$

for  $f = \cos(x)$  for the following 4 values of  $x$ ,

$$x \in \left\{ \frac{1}{10}, \frac{2}{10}, \frac{3}{10}, \frac{4}{10} \right\} \text{ which is equivalent to}$$

$$x = \frac{j}{10}, \text{ for } j = 1, 2, 3, 4.$$

For each value of  $j$ , find the smallest integer  $n$  such that

$$\left| T_n\left(\frac{j}{10}\right) - \cos\left(\frac{j}{10}\right) \right| < 10^{-12}.$$

Calculate the "exact" value using `np.cos(x)`. Present your results in a table and discuss them. How do your errors compare to the error bounds for Taylor polynomials that we discussed in class? Remember that the error for a Taylor polynomial is given by its remainder term

$$R_n(x) = f(x) - T_n(x) = \frac{f^{(n+1)}(c)}{(n+1)!} (x-a)^{n+1}$$

Include all of your analysis and discussion in an `.ipynb` file and submit the file through Blackboard. The name of the file you submit should be `lastname_firstname_AS03.ipynb`.

Do not clear your results after your last run so that I will be able to see your results without rerunning your file.

If you collaborate with anyone on this assignment, be sure to follow the collaboration guidelines in the syllabus including listing with whom you collaborated in your ipynb file.

While collaboration is fine, DO NOT submit exactly the same file as your collaborations. Your code and your discussion must be your own.