

CSc 30100
Assignment Due
9:00 am EDT
Tuesday, March 19, 2019

Calculate the Taylor Polynomials $T_n(x) = \sum_{k=0}^n \frac{f^{(k)}(0)}{k!} (x)^k$

centered at 0 for the following functions at the values of x ,

$$x \in \left\{ \frac{1}{32}, \frac{1}{16}, \frac{1}{8}, \frac{1}{4}, \frac{1}{2}, 1, 2, 4 \right\} \text{ and for}$$

$$n \in \{1, 2, 3, 4, 8, 16, 32, 64, 128, 256\}$$

$$\sin(x)$$

$$\cos(x)$$

$$\exp(x)$$

$$\log_e(1-x) \quad x < 1$$

To perform the calculations you will need to use an expression for $f^{(k)}(x)$ and then substitute in the 0 for the value of x . For example, for $f(x) = \sin(x)$,

$$\sin^{(0+4n)}(x) = \sin(x), \quad \sin^{(0+4n)}(0) = \sin(0) = 0$$

$$\sin^{(4n+1)}(x) = \cos(x), \quad \sin^{(4n+1)}(0) = \cos(0) = 1$$

$$\sin^{(4n+2)}(x) = -\sin(x), \quad \sin^{(4n+2)}(0) = -\sin(0) = 0$$

$$\sin^{(4n+3)}(x) = -\cos(x), \quad \sin^{(4n+3)}(0) = -\cos(0) = -1.$$

Do not use a computational function to calculate these derivatives; use a mathematical expression and take the value of that expression at 0.

For each of the $T_n(x)$ that you calculate, compare the result to the exact value of the function $f(x)$ and determine the absolute and relative errors of the results. Present your results as clearly as you can (e.g., a nicely formatted table or plots(s)).

Include all of your analysis and discussion in your .ipynb file and submit the file thorough Blackboard. The nume of the file you submit should be
firstname_lastname_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.