

AMSC/CMSC 460: HW #6
Due: Tuesday 3/27/18 (in class)

Please submit the solution to at least one problem in LaTeX.

1. Use the zeros of the Chebyshev polynomial $T_2(x)$ to construct a linear interpolating polynomial for the following functions on the interval $[-1, 1]$:
 - (a) $f(x) = e^{-2x}$
 - (b) $f(x) = \ln(x + 3)$
2. Repeat both parts of problem (2) using the zeros of $T_3(x)$ to construct quadratic interpolation polynomials at Chebyshev points for the given functions.
3. Use the zeros of the Chebyshev polynomial $T_3(x)$ and transformations of the given interval to construct an interpolating polynomial of degree two for the following functions
 - (a) $f(x) = e^{3x} + x$ on $[0, 3]$
 - (b) $f(x) = (x + 2) \ln x$ on $[2, 2.5]$
4. Find a quartic polynomial (written in Newton's form) that takes these values: $p(0) = 1$, $p(1) = -2$, $p(2) = 3$, $p'(0) = -2$, and $p'(1) = 2$.
5. What condition will have to be placed on the nodes x_0 and x_1 if the interpolation problem

$$p(x_i) = c_{i0}, \quad p''(x_i) = c_{i2}, \quad i = 0, 1$$

is to be solvable by a cubic polynomial (for arbitrary c_{ij})?