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

1. Compute the following values (for Chebyshev polynomials $T_n(x)$):

    (a) $T_{2n+1}(0)$

    (b) $T_{2n}(0)$

    (c) $T_n(-1)$

2. 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) $f(x) = e^x$

    (b) $f(x) = \ln(x + 2)$

3. 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.

4. 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) $f(x) = e^{-2x}$ on $[0, 2]$

    (b) $f(x) = (x + 1) \ln x$ on $[1, 4]$