Computer Assignment 2

Let
\[ f(x) = \frac{1}{x^2 + 1} \]
on the interval \([-5, 5]\). Let \( p_n(x) \) be the polynomial which interpolates \( f(x) \) at \( n + 1 \) equally spaced nodes between -5 and 5, given by
\[ x_i = -5 + \frac{10i}{n} \quad \text{for} \ 0 \leq i \leq n. \]

Let \( q_n(x) \) be the polynomial which interpolates \( f(x) \) at \( n + 1 \) Chebyshev nodes between -5 and 5, given by
\[ x_i = 5 \cos \left( \frac{(2i + 1)\pi}{2n + 2} \right) \quad \text{for} \ 0 \leq i \leq n. \]

At each of the values \( x = -5, -4.9, -4.8, -4.7, -4.6, \) and \(-4.5\), compute \( p_{15}(x), p_{20}(x), q_{15}(x), \) and \( q_{20}(x), \) and compare with \( f(x). \) Graph and discuss your results. (The graph can be done by hand.)

(Note: In your answer to this question, include the input you gave to the programs you used, and the output from the programs. If you have a TI-85 or TI-86, then you can do this problem using the programs NODE, CHEB, DVDF, and NVAL from my website. If you do not use these programs, then please also include copies of the programs you used.)