# Polynomial Deflation Project

Your work should be presented in the form of a typed report using clear and properly punctuated English. Where appropriate include full program listings and output.

1a. Consider the polynomial $P(x) = a_0 + a_1 x + a_2 x^2 + \cdots + a_n x^n$. Define

$$m = \max\left\{\, |a_i| : i = 0, \ldots, n-1 \,\right\} \qquad \text{and} \qquad r = \frac{m}{|a_n|} + 1.$$

Show that $P(x) \neq 0$ for $|x| > r$.

b. Write a program to evaluate $P(x)$ and it's derivative using nested multiplication. Tabulate values for the polynomials given in `deflation.dat` at $20n$ equally spaced points on the interval $[-r, r]$. The file `deflation.dat` is also available in the attachments sidebar.

c. Plot each polynomial.

d. There is a root in the interval between every two tabulated values of $P(x)$ which change sign. Use the method of false position to obtain an initial approximation and then Newton's method to find each root. Do this for each polynomial in `deflation.dat`.

e. Did your program find all real roots for every polynomial? If not, explain why. What effect does increasing the number of tabulated values on the interval $[-r, r]$ have?

f. Use Müller's method and deflation to find all roots (both real and complex) for the polynomials in `deflation.dat`.