Assignment 2: Root-finding Using Bisection Method

This assignment has multiple parts:

Begin by considering the polynomial:



which as we discussed in class, has three real roots at x=-2.5,0.5, and 1.5

1. Write a standalone C++ program which calculates the roots of this polynomial using the bisection algorithm. The program should fill an array of 10,000 data points between x=-4.0 and x=4.0. Then, the program should do a sparse search of this array, i.e. once every n\_search elements, to look for sign changes, and subsequently using the bisection algorithm to find the root. The program should also keep track of the approximate total number of instructions taken to find the three roots (n\_steps).
2. Create a plot, using a ROOT macro, of the number of steps taken (n\_steps) vs. the sparsification size (n\_search), for n\_search values between 1 and 10,000.
3. Deduce the source of the various patterns that you observe in part b). Hint: You might consider adjusting the number of data points in the original array, as well as the coefficients of the polynomial, slightly.
4. Create a single ROOT macro that both finds the roots of the polynomial, as well as creates the plot from part b)
5. Modify the macro created in part d) to allow for the possibility to find the roots of other polynomials or functions.