Problem 1.1

The bisection method and the newton method are methods that calculate the roots of a given function.

The bisection method has a simple methodology to finding the root of a given function. The bisection method will find a root given an interval where a root is present. This method is relatively slow and not as accurate when compared to other methods. The benefit to this method is that the search for the root is safe. The search will stay within the interval that was specified and wont travel to a far unwanted place in the domain of the function.

Newtons method is also a simple methodology, but it preforms quite exceptionally for its simplicity. This method takes a single starting point to start the search for a root. This method is very fast and is very accurate for the amount of iterations that it goes through especially when compared to the bisection method. The disadvantages of newtons method is that you cannot specify an interval. Depending on the starting point that is put into the function it will start to look for a root either to the left or to the right of the point specified. With the newton method there is a possibility in each iteration that the starting point lands in a place where the slope is near zero. if this is ever the case then the function could end up in some random place and find a root in an unexpected place. Newtons method is also prone to follow asymptotes up to where they diverge. This is a problem because the method can go in an infinite loop looking for a root that is not there. It can be even more unexpected when the search jumps to a random place in a domain and when that random place is near an asymptote.

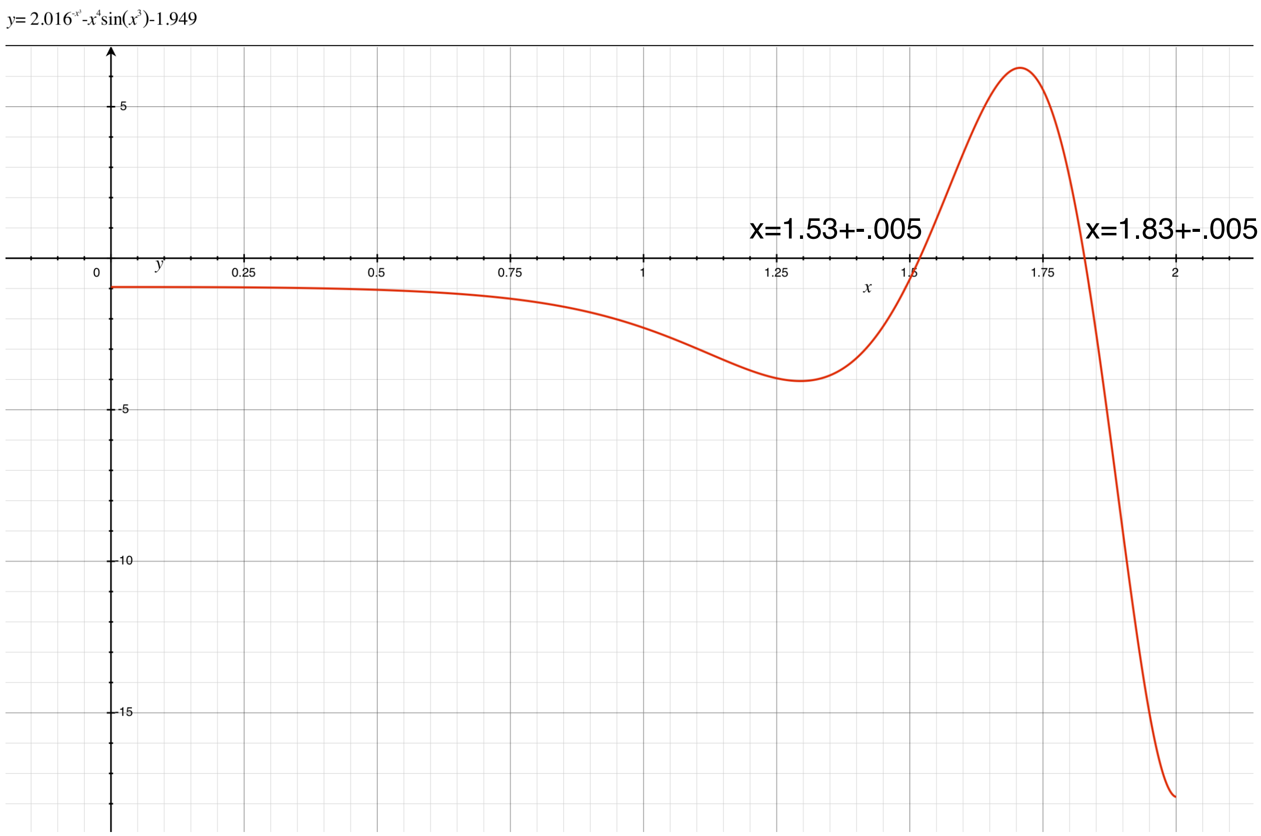
To summarize the bisection method is a safe method that is easily controlled. Usually nothing surprising happens when using this method, but it comes as a trade of speed and precision. Newtons method is not easily controlled, but that risk comes with the benefit of being fast an accurate.

Bisection Method	Newton Method
Slow	Fast
Accurate	Very Accurate
Controlled (interval bound)	Not Predictable (can jump to unwanted domain space)

Problem 1.2 / 1.3

This graph was graphed using the built in mac app called Grapher. It can be found by searching Grapher.app in OSX, can also be found in the Applications folder (Applications/Utilities/Grapher.app). The file part2_equation.gcx can be opened by the Grapher.app can you can see the graph.

The numbers on the graph are my eye ball guesses for the roots.



Solution Chart.

The program arguments specify starting intervals and starting points.

Program Arguments		Bisection interval Lower	Upper	Newton Approximation
1.5	**1.6**	1.518262	1.518359	1.518359
1.8	**1.9**	1.828027	1.828125	1.828125

For arguments with a delta that are 0.1 it takes 10 iterations to arrive at a solution for bisection.

For the starting points 1.5 and 1.8 it took newtons method 2 iterations to arrive at a solution.