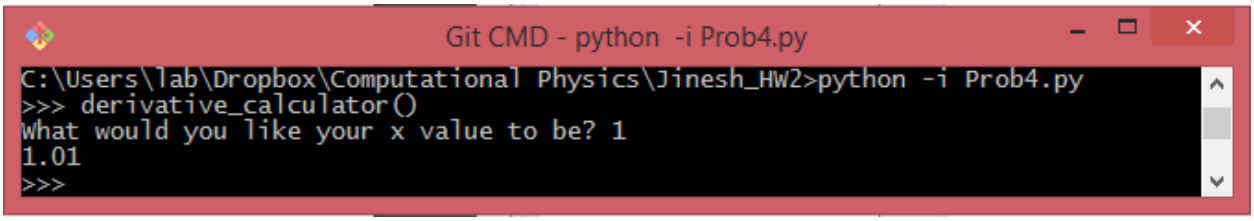
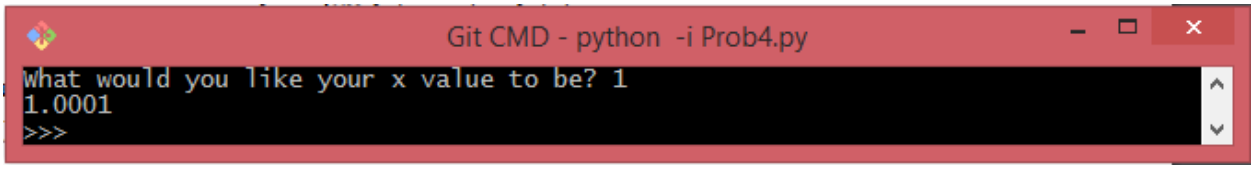
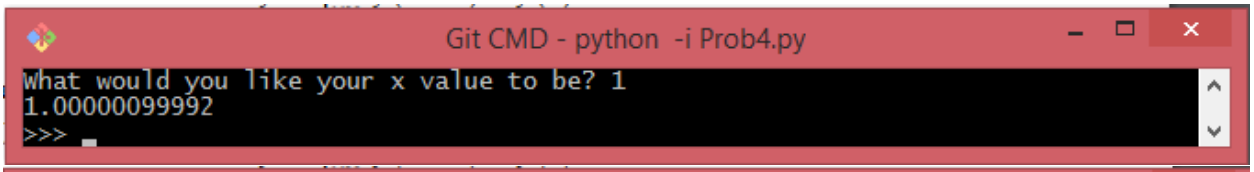
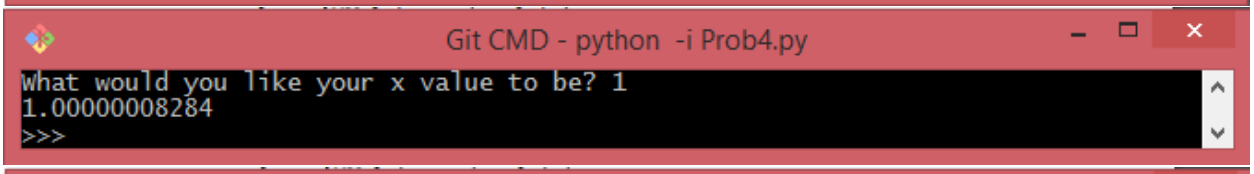
Problem 3:

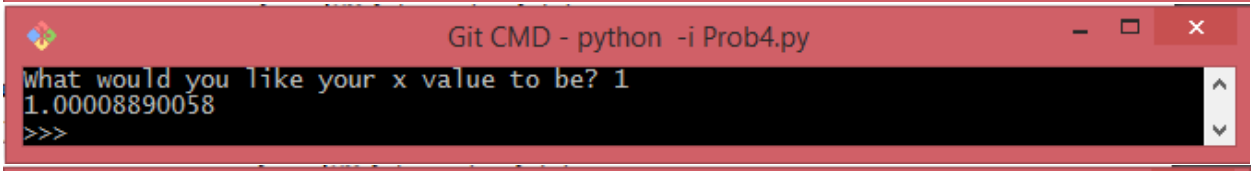


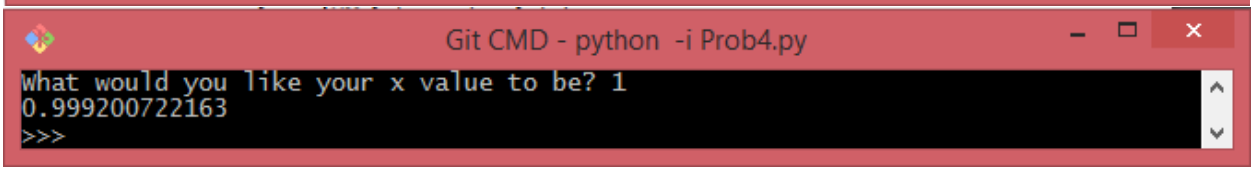
This is the result for part a of problem three. The reason that the analytical derivative and the numerical derivative disagree is because the numerical derivative is not 100% precise. We are using a delta value that can still be picked up within python's range of computation.











For the above screenshots, they are the different variations of the calculation with different delta values going from 10^-4 to 10^-14 respectively. The reason that the derivative gets worse is because of python's accuracy issues and how big the slices are. When the slices are too small, they won't count in python's computation of a value, thus creating an error that's larger than expected.