Lab2

The ideal gas law is given by: $PV=nRT$ where P is the absolute pressure, V the volume, n the number of moles, R the universal gas constant and T the absolute temperature.
It is only accurate over a limited range of pressure and temperature.
An alternative equation of state for gases is given by the Walls equation

$$\left(P+\frac{a}{v^2}\right)(v-b)=RT$$

Where $v=V/n$ is the modal volume, a and b are empirical constants depending on the nature of the gas.
A chemical engineering design process requires accurately estimating the modal volume of oxygen for a given temperature and pressuring so that appropriate containment vessels can be selected.
R= 0.082054 atm/(mol K)
a=1.360
b=0.03183

The design pressures of interest are: *1, 10 and 100 atm* for temperature combinations of *300, 500 and 700 K*

a) Rewrite you problem as $f(v)=0$ and plot f versus v ; check that the solution is on the interval [2, 2.2.5]

b) For *P=10 atm and T=300K* find the modal volume using all the two braketing methods seen in class.

c) Plot the approximate error done at each iteration for all the methods and decide which one performs better.

d) Use the best method to evaluate the modal volume for each combination of pressure/temperature, compare your results with the ideal gas law.

e) Write a proper report explaining your methods, how you implemented them, discussing your results and your convergence rates.