CSC 2262, Fall 2021, Lab 7

The Beattie-Bridgeman equation of state

$$P = \frac{RT}{V} + \frac{a}{V^2} + \frac{b}{V^3} + \frac{c}{V^4}$$

is a three-parameter extension of the ideal gas law, where P is the pressure, V is the volume, the temperature T = 270°, R = 0.082, a = -1.06, b = 0.057, and c = -0.001 .

If we multiply both sides by V^4, the equation becomes

$$PV^4 = RTV^3 + aV^2 + bV + c$$

You can use this version of the equation to calculate V. It is completely equivalent to the equation at the top of the page.

Write a MATLAB program as follows:

1) **P will go from 2 atm to 12 atm in steps of 2 atm. Use an outer for loop to generate the values of P. The statements to calculate V and print a line of output will be inside this outer for loop.**

2) **For each value of P, call a function that uses Newton's Method to calculate the value of V that satisfies the second equation from the top. Name this function Newton. Use 10 as the initial guess for V and 1e-7 as the accuracy factor. Print P and V.**

The output of this program should look like this:

```
P= 2  V=11.02215
P= 4  V= 5.48718
P= 6  V= 3.64221
P= 8  V= 2.71974
P=10  V= 2.16627
P=12  V= 1.79731
```