Assignment 3

An undersaturated oil reservoir material balance simulator computes the cumulative oil produced from a block, in a discretized model, thus:

$$N_p = \frac{NB_{oi}c_e(P_i - P_{now})}{B_o} - - - - - - - - - P5$$

- N_p is the cumulative oil produced from a given block.
- N is the initial oil in place (STOIIP) in a block (assumed constant for all)
- B_{oi} is the initial oil formation volume factor (assumed constant for all blocks)
- c_e is the effective compressibility (assumed constant for all blocks)
- P_i is the initial reservoir pressure (assumed constant for all blocks)
- P_{now} is the current reservoir pressure (varies across blocks depending on proximity to producer well)
- B_o is the current value of the oil formation volume factor (depends on current pressure in a block)

Below is the expression to calculate the B_o value corresponding to a given current pressure.

$$B_o = B_{ob}[1 - c_o(P_{now} - P_b)] - - - - - - - - - - - - P6$$

Given a set of parameter (N, B_{oi}, B_{ob}, c_e, c_o, P_b and P_i) values and a grid of current pressure values, write a Python script to implement Equations P5 and P6 for each block. Also include statements to sum up and present the total cumulative oil produced from the entire reservoir.

Save the script as *mat_bal.py*, commit and push it to your GitHub repository. Submit the URL to your copy of *PET328_2021_Class* repository. Furthermore, send a pull request to the original *TTOWG/ PET328_2021_Class* repository.

You may test your script with the following data:

Parameters
N = 200,779.157 STB
P_i = 4025 psi
P_b = 3330 psi
B_{oi} = 1.2417 RB/STB
B_{ob} = 1.2511RB/STB
c_e = co = 0.0000113 psi^{-1}

Current pressure values in grid:

4018.913	4018.875	4018.802	4018.699
4018.905	4018.866	4018.79	4018.682
4018.89	4018.848	4018.765	4018.648