Hometask 11

(a) A healthcare company wants to predict the muscle mass percentage of individuals based on three factors: daily protein intake (in grams), exercise hours per week and hydration level (in liters per day). The dataset is as follows:

Protein Intake	Exercise	Hydration	Muscle Mass Percentage
80	5	3	45
100	7	3.5	50
90	6	3.2	48
110	8	4	55
95	6.5	3.8	50

- Perform 3 iterations of the Lasso regression with $\alpha = 0.05$ and learning rate $\eta = 0.0001$.
- Report the updated coefficients b, w_1, w_2 and w_3 after each iteration.
- Calculate the Mean Squared Error (MSE) after each iteration
- Predict the muscle mass percentage for an individual consuming 105g of protein daily, exercising 7.5 hours per week and hydrating with 3.6L per day using the final model.
- What is regularization? Why is it used in models like Lasso and Ridge regression?
- What happens if we set a very high value of α? Explain the impact on the model.

(b) Write a Python program to perform 3 iterations of the Lasso regression with $\alpha = 0.05$ and learning rate $\eta = 0.0001$.Display the values of b, w_1, w_2, w_3 and MSE after each iteration. Use the final model to predict the muscle mass percentage for an individual consuming 105g of protein, exercising 7.5 hours per week and hydrating with 3.6L per day.