Supervised Learning - Polynomial Regression with L1 Regularization:

The **`microsoft_stock.csv`** file contains historical stock data for Microsoft Corporation (MSFT). This data is often used in financial and machine learning projects to analyze and predict stock prices.

Here's a brief explanation of the typical columns you might find in this file:

1. Date → The date on which the trading took place. The format is usually `YYYY-MM-DD`.
2. Open → The opening price of the stock on that particular day.
3. High → The highest price of the stock during the trading day.
4. Low → The lowest price of the stock during the trading day.
5. Close → The closing price of the stock on that particular day. This is often the target variable for prediction.
6. Volume → The number of shares traded during the day.

Exercise instructions:
Use the **'microsof_stock.csv'** file provided to you and execute the following instructions:

Data Preparation:

1. From the entire dataframe select the following columns as the features:
    a. `Open`
    b. `High`
    c. `Low`
    d. `Volume`
2. Select the `Close` column as the label variable.

Polynomial Regression Machine Learning:

1. Perform Polynomial Regression machine learning on the features selected.
2. Use train / test split to split the data (select 30% columns for the test set and seed of 42).
3. Examine all degree options from 1 - 8 degrees.
4. Choose the optimal polynomial regression degree and base your answer on Error vs Degree plot.

5. Evaluate your model results with the optimal polynomial degree using MAE, MSE, RMSE error metrics.
6. Plot the y_test vs residuals scatter plot and determine if your data set was a good fit for linear regression modeling.

Model Regularization L1:

1. Perform Polynomial Regression machine learning on the features selected with the optimal degree you found on the previous exercise.
2. Perform feature scaling of type Standardization.
3. Perform Ridge Regression and examine15 different alpha values from range of 0.1 to 3 and scoring based on MAE (mean absolute error)..
4. Find the optimal alpha value and print it.
5. Evaluate your Ridge model results with the optimal polynomial degree using MAE, MSE, RMSE error metrics.

Model Deployment:

1. Once you are happy with your Ridge model results, train your Ridge Regression model on the entire polynomial dataset.
   Use the optimal polynomial degree and the optimal alpha value you found.
2. Print the final beta coefficient the model found for each feature.
3. Export your final model into a joblib file.
   Make sure you also export other relevant preprocessing instances such as the polynomial converter and the standard scaler.
4. Import your final model and the preprocessing instances from the joblib files and load them back to your working area.
5. Use the import model to predict the ‘close’ value of the following unknown data points:
   a. **Open:** 250.00, **High:** 255.00, **Low:** 249.50, **Volume:** 23,000,000
   b. **Open:** 260.00, **High:** 265.00, **Low:** 259.50, **Volume:** 21,500,000
   c. **Open:** 245.00, **High:** 250.00, **Low:** 244.50, **Volume:** 22,000,000