Q.1. Outline the key conceptual steps involved in performing **Principal Component Analysis (PCA)** on a dataset.

Q.2. Explain the role of the **covariance matrix** in Principal Component Analysis (PCA).

Q.3. Explain the core principle of **Linear Regression**. How does the algorithm determine the "best-fit line," and why do we minimize the **sum of squared errors**?

Q.4. Why is Linear Regression generally unsuitable for binary classification tasks? Explain how **Logistic Regression** overcomes this limitation.

Q.5. In what scenarios would you choose to use **Polynomial Regression** over Simple Linear Regression? Use a conceptual diagram to illustrate a situation where a polynomial model would provide a better fit.

Q.6. Compare and contrast **Ridge Regression (L2)** and **Lasso Regression (L1)** by discussing the following:

- The nature of the penalty term added to their respective loss functions.
- Their differing effects on model coefficients, particularly how Lasso's methodology enables it to perform automatic **feature selection**.

Q.7. Briefly explain the purpose of **Elastic Net Regression** and describe how it combines the strengths of both Ridge and Lasso Regression.

Q.8. State the formula for **Bayes' Theorem**. What is the "naive" assumption that the Naive Bayes classifier makes about the features in a dataset, and why is this assumption critical for the algorithm's simplicity and efficiency?

Q.9. Compare and contrast the following three variants of the Naive Bayes algorithm.

- **Gaussian Naive Bayes**
- **Multinomial Naive Bayes**
- **Bernoulli Naive Bayes**