9.

Feature	Simple Linear Regression	Multiple Linear Regression
Definition	Predicts Y using one independent variable (X).	Predicts Y using two or more independent variables ($X_1, X_2, ..., X_n$).
Equation	$Y = b_0 + b_1 X + \epsilon$	$Y = b_0 + b_1 X_1 + b_2 X_2 + ... + b_n X_n + \epsilon$
Number of Predictors	One (X)	Two or more ($X_1, X_2, ..., X_n$)
Geometric Representation	A **straight line** in 2D space.	A **hyperplane** in $n + 1$ dimensions.
Visualization	Can be plotted on a 2D graph.	Can be visualized in 3D if $n = 2$, but not easily for $n > 2$.
Use Case Example	Predicting salary based on experience.	Predicting salary based on experience, education, and skills.
Complexity	Simple and easy to interpret.	More complex but captures relationships between multiple features.

14.

Suppose we model **salary** based on **experience** (X_1) and **education level** (X_2):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$$

If **experience and education together impact salary**, we introduce an **interaction term** ($X_1 \times X_2$):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 (X_1 \times X_2) + \epsilon$$

Here, **β_3 ($X_1 \times X_2$)** represents the additional effect when both experience and education interact.

24,25,26.

Feature	Linear Regression	Polynomial Regression
Relationship	Models a **straight-line** relationship	Models a **curved** relationship
Equation	$y = b_0 + b_1 x$	$y = b_0 + b_1 x + b_2 x^2 + b_3 x^3 + \dots$
Complexity	Simpler and easier to interpret	More complex, fits non-linear data
Flexibility	Limited in capturing patterns	Can capture **non-linear** trends
Risk	May **underfit** if data is non-linear	May **overfit** if too many polynomial terms are used