1) Explain the difference between simple linear regression and multiple linear regression. Provide an

example of each.

Ans- Simple linear regression has only one x and one y variable. Multiple linear regression has one y and two or more x variables.

We could use the equation to predict weight if we knew an individual's height. In this example, if an individual was 70 inches tall, we would predict his weight to be: Weight = 80 + 2 x (70) = 220 lbs. In this simple linear regression, we are examining the impact of one independent variable on the outcome.

Multiple Linear Regression is one of the important regression algorithms which models the linear relationship between a single dependent continuous variable and more than one independent variable. Example: Prediction of CO2 emission based on engine size and number of cylinders in a car.

2) Discuss the assumptions of linear regression. How can you check whether these assumptions hold in a given dataset?

Ans- There are primarily five assumptions of linear regression. They are:

1. There is a linear relationship between the predictors (x) and the outcome (y)
2. Predictors (x) are independent and observed with negligible error
3. Residual Errors have a mean value of zero
4. Residual Errors have constant variance
5. Residual Errors are independent from each other and predictors (x)

Assumptions for Simple Linear Regression  
  
Linearity: The relationship between and must be linear. Check this assumption by examining a scatterplot of x and y. Independence of errors: There is not a relationship between the residuals and the variable; in other words, is independent of errors.

3) How do you interpret the slope and intercept in a linear regression model? Provide an example using a real-world scenario.

Ans- The greater the magnitude of the slope, the steeper the line and the greater the rate of change. By examining the equation of a line, you quickly can discern its slope and y-intercept (where the line crosses the y-axis). The slope is positive 5. When x increases by 1, y increases by 5.

4) Explain the concept of gradient descent. How is it used in machine learning?

Ans- Gradient descent is an optimization algorithm which is commonly-used to train machine learning models and neural networks. Training data helps these models learn over time, and the cost function within gradient descent specifically acts as a barometer, gauging its accuracy with each iteration of parameter updates.

A gradient is a derivative of a function that has more than one input variable. It is a term used to refer to the derivative of a function from the perspective of the field of linear algebra

5) Describe the multiple linear regression model. How does it differ from simple linear regression?

Ans- Multiple regression is a broader class of regressions that encompasses linear and nonlinear regressions with multiple explanatory variables. Whereas linear regress only has one independent variable impacting the slope of the relationship, multiple regression incorporates multiple independent variables.

6) Explain the concept of multicollinearity in multiple linear regression. How can you detect and

address this issue?

Ans- Multicollinearity happens when independent variables in the regression model are highly correlated to each other. It makes it hard to interpret of model and also creates an overfitting problem. It is a common assumption that people test before selecting the variables into the regression model.

7) Describe the polynomial regression model. How is it different from linear regression?

Ans- Polynomial regression is a form of Linear regression where only due to the Non-linear relationship between dependent and independent variables, we add some polynomial terms to linear regression to convert it into Polynomial regression.

It is more flexible than linear regression because: GLM works when the output variables are not continuous or unbounded. GLM allows changes in unconstrained inputs to affect the output variable on an appropriately constrained scale.

8) What are the advantages and disadvantages of polynomial regression compared to linear

regression? In what situations would you prefer to use polynomial regression?

Ans- Polynomial provides the best approximation of the relationship between the dependent and independent variable. A Broad range of function can be fit under it. Polynomial basically fits a wide range of curvature.

The polynomial regression is flexible enough to get fitted in a vast range of curvatures. A broad range of functions can easily fit under it. The polynomial regression offers the best approximation of the relationship between the two dependent and independent variables.