**Linear Regression:**

1. *Aim of the algorithm:*

Linear regression aims to model the relationship between a dependent variable and one or more independent variables by fitting a linear equation to observed data.

1. *Details of the algorithm:*

Linear regression involves finding the line that best fits the data points, minimizing the sum of the squared differences between observed and predicted values.

1. *Assumptions:*

Assumptions include linearity (relationship is linear), independence of errors, homoscedasticity (constant variance of errors), and normality of errors.

1. *Theorems:*

Linear regression is based on statistical principles, and theorems such as the Gauss-Markov theorem highlight the conditions under which the ordinary least squares (OLS) method produces the Best Linear Unbiased Estimators (BLUE).

1. *Numerical features:*

Numerical features involve techniques like the least squares method for parameter estimation. The algorithm is sensitive to outliers and multicollinearity.

**Quadratic Regression:**

1. *Aim of the algorithm:*

Quadratic regression extends linear regression to model relationships with a quadratic term, allowing for a curved fit to the data.

1. *Details of the algorithm:*

Quadratic regression fits a quadratic equation (y = ax^2 + bx + c) to the data, involving the estimation of coefficients a, b, and c.

1. *Assumptions:*

Similar to linear regression, quadratic regression assumes a relationship between variables but allows for a more flexible, curved relationship.

1. *Theorems:*

While quadratic regression doesn't rely on specific theorems, it builds upon the principles of regression analysis, incorporating quadratic terms for improved model fitting.

1. *Numerical features:*

Numerical aspects involve solving for the coefficients using methods like least squares. Quadratic regression can be sensitive to outliers and may require careful consideration of model complexity.

**Least Squares Solution of Linear Systems:**

1. *Aim of the algorithm:*

The aim is to find a solution to an overdetermined system of linear equations (more equations than unknowns) by minimizing the sum of the squared differences between the observed and predicted values.

1. *Details of the algorithm:*

The algorithm involves formulating the system of equations in matrix form (Ax = b), where A is the coefficient matrix, x is the vector of unknowns, and b is the vector of observed values. The least squares solution minimizes the residual sum of squares (RSS), given by ||Ax - b||^2.

1. *Assumptions:*

Assumptions include linearity of the model, full rank of the coefficient matrix, and independent and identically distributed errors.

1. *Theorems:*

The solution is based on principles from linear algebra and optimization. The solution is obtained using the Normal Equations (ATAx = ATb), and the Gauss-Markov theorem ensures that the least squares estimators are BLUE (Best Linear Unbiased Estimators) under certain conditions.

1. *Numerical features:*

Numerical techniques involve solving the system of normal equations, often using methods like QR decomposition or singular value decomposition. The algorithm is robust and suitable for overdetermined systems.