

Theoretical Part

1. I think we need more information to justify. However, in my opinion, Polynomial regression will have a less SSR on training data. Linear regression is regarded as inflexible because it is biased towards linear relationships among its variables. And also some outliers may influence the fit of the model. However, polynomial regression is more flexible and may detect some non-linear relationships among data. Therefore, the polynomial regression may have less SSR and can better fit the data.
2. For the test data, if there is a true relationship between X and Y is linear, I believe the linear regression may have less SSR. Because the polynomial may overfit the data and have more errors than linear regression. Therefore, I believe the linear regression may have lower SSR on test data.
3. I think the Polynomial regression will have lower SSR on training data. The answer is almost the same the question 1. Because Polynomial regression has more flexibility and deal with non-linear in a better way than linear regression. Therefore, I believe the polynomial regression will have a lower SSR.
4. I think we need more information to decide which model is better because we do not know how far it is from linear. If it is closer to linear regression, then we may believe that the linear regression may have a lower SSR on test data. However, if it is more closer to polynomial regression, then the polynomial regression may fit the data better and have a lower SSR.