21. d) Both and b

a) $\beta_0$, $\beta_1$, ..., $\beta_r$ are indeed the regression coefficients. The coefficients represent the weights assigned to the independent variables in the linear regression model. $\beta_0$ is the intercept term, and $\beta_1$, ..., $\beta_r$ are the coefficients for $x_1$, ..., $x_r$ respectively.

b) Linear regression does involve determining the best predicted weights by using the method of ordinary least squares. Ordinary least squares is a common method used to estimate the regression coefficients by minimizing the sum of squared differences between the observed dependent variable values and the predicted values based on the regression equation.

c) The statement about E being the random interval is not relevant to linear regression and is therefore not true.

22. d) The value $R^2$ = 1, which corresponds to SSR = 0

In linear regression, $R^2$ (R-squared) is a statistical measure that represents the proportion of the variance in the dependent variable that is predictable from the independent variables. It ranges from 0 to 1, where a value of 1 indicates a perfect fit.

SSR (Sum of Squared Residuals) measures the total sum of squared differences between the observed dependent variable values and the predicted values based on the regression equation. A perfect fit implies that there is no residual error, meaning that the predicted values perfectly match the observed values, resulting in SSR = 0.

Therefore, the correct statement indicating a perfect fit in linear regression is that the value $R^2$ = 1, which corresponds to SSR = 0.

23. b) B0

In simple linear regression, the value that shows the point where the estimated regression line crosses the $y$-axis is represented by the coefficient $B_0$ (beta-zero) or the intercept term.

24. d) The top-left plot

An underfitted model is one that fails to capture the underlying patterns and

relationships in the data. It typically exhibits high bias and low variance.

25.  d) d, b, e, a, c

d) Import the packages and classes that you need.
b) Provide data to work with, and eventually do appropriate transformations.
e) Create a regression model and fit it with existing data.
a) Check the results of model fitting to know whether the model is satisfactory.
c) Apply the model for predictions.

26. b) fit_intercept
c) normalize
d) copy_X
e) n_jobs
The parameters "fit_intercept," "normalize," "copy_X," and "n_jobs" are optional
parameters that can be passed to the LinearRegression class in scikit-learn.

27. c) Polynomial regression

In polynomial regression, you need to transform the array of inputs to include
nonlinear terms such as $x^2$. Polynomial regression extends simple linear
regression by introducing polynomial terms of the original input features. By
including these nonlinear terms, the model can capture more complex
relationships between the input variables and the target variable.

28.  c) You need more detailed results.

Statsmodels is a Python library that provides more extensive statistical analysis
capabilities compared to scikit-learn. It offers a wide range of statistical models
and tools for exploring and analyzing data. If you require more detailed statistical
results, such as p-values, confidence intervals, and statistical tests, statsmodels
would be a better choice. It provides comprehensive summary outputs that
include detailed statistical information about the model and its coefficients.

29.  b) Numpy

NumPy is a fundamental package for scientific computing with Python. It is
widely used in the scientific and data analysis communities. NumPy provides a
powerful and efficient multidimensional array object, along with a collection of

mathematical functions and tools for performing various numerical computations.

30. b) Seaborn

Seaborn is a Python data visualization library that is based on Matplotlib. It is designed to provide a high-level interface for creating visually appealing and informative statistical graphics. Seaborn simplifies the process of creating various types of plots, such as scatter plots, bar plots, box plots, and more, with concise and intuitive syntax.