9.Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and drawgraphs.

```
import numpy as np
import matplotlib.pyplot as plt


# Bokeh version is in alternatives folder


def radial_kernel(x0, X, tau):
    return np.exp(np.sum((X - x0) ** 2, axis=1) / (-2 * tau * tau))  # Weight or Radial Kernel Bias
Function


def local_regression(x0, X, Y, tau):
    # add bias term
    x0 = np.r_[1, x0]  # Add one to avoid the loss in information
    X = np.c_[np.ones(len(X)), X]

    # fit model: normal equations with kernel
    xw = X.T * radial_kernel(x0, X, tau)  # XTranspose * W

    beta = np.linalg.pinv(xw @ X) @ xw @ Y  # @ Matrix Multiplication or Dot Product

    # predict value
    return x0 @ beta  # @ Matrix Multiplication or Dot Product for prediction


n = 1000
# Generate dataset
X = np.linspace(-3, 3, num=n)
print("The Data Set ( 10 Samples) X:\n", X[1:10])
Y = np.log(np.abs(X ** 2 - 1) + .5)
print("The Fitting Curve Data Set (10 Samples) Y:\n", Y[1:10])
# Jitter X
X += np.random.normal(scale=.1, size=n)
print("Jitter (10 Samples) X :\n", X[1:10])

domain = np.linspace(-3, 3, num=300)
print(" Xo Domain Space(10 Samples):\n", domain[1:10])


def plot_lwr(tau):
    # Prediction through regression
    predictions = [local_regression(x0, X, Y, tau) for x0 in domain]
    plt.scatter(X, Y, color='blue', alpha=0.3, s=20)
    plt.plot(domain, predictions, color='red', linewidth=3)
    plt.show()
```

```
# Plotting the curves with different tau
plot_lwr(10.)
plot_lwr(1.)
plot_lwr(0.1)
plot_lwr(0.01)
```

OUTPUT

The Data Set (10 Samples) X:
[-2.99399399 -2.98798799 -2.98198198 -2.97597598 -2.96996997 -2.96396396 -2.95795796 -2.95195195 -2.94594595]

The Fitting Curve Data Set (10 Samples) Y:
[2.13582188 2.13156806 2.12730467 2.12303166 2.11874898 2.11445659 2.11015444 2.10584249 2.10152068]

Jitter (10 Samples) X :
[-3.00550309 -2.9692418 -3.10678549 -3.00803474 -3.04121224 -2.80934575 -2.97409936 -2.99156208 -2.93666494]

Xo Domain Space(10 Samples):
[-2.97993311 -2.95986622 -2.93979933 -2.91973244 -2.89966555 -2.87959866 -2.85953177 -2.83946488 -2.81939799]