19/3/25

Lab-3 : Linear Regression:

Apply Linear Regression to predict 7th & 9th month data.

Q. Apply Linear Regression

x:(week)	y:(sales in thousand)
1	1.2
2	1.8
3	2.6
4	3.2
5	3.8

Code:

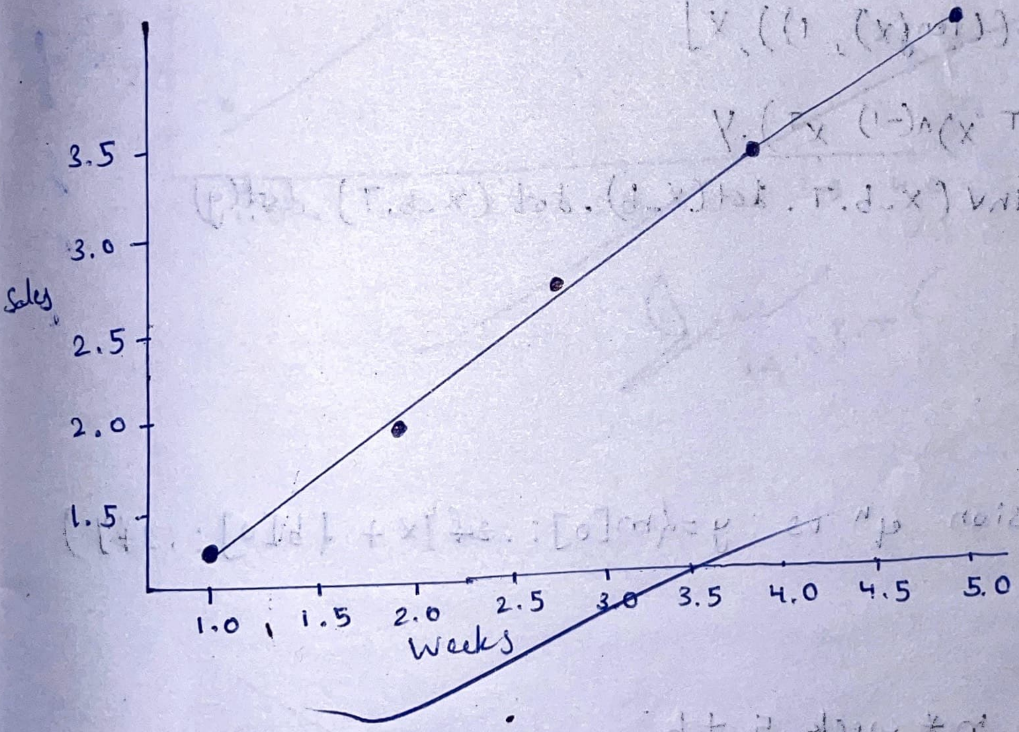
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

df = pd.read_csv('sales.csv')

weeks = df['x:(week)'].values
sales = df['y:(sales in thousand)'].values

# calc slope(m) & interecept (b) for LR
n = len(weeks)

sum_x = np.sum(weeks)
sum_y = np.sum(sales)
sum_x2 = np.sum(weeks**2)
sum_xy = np.sum(weeks *sales)

# slope(m)  & intercept(b)
m = (n * sum_xy - sum_x * sum_y) / (n * sum_x2  -sum_x**2)

b = (sum_y  - m * sum_x) / n

print (f"The regression eqn is: y = {m:.2f}x + {b:.2f}")

# predict the sales for 7th & 9th weeks
week_7 = 7
week_9 = 9

predicted_sales_7 = m * week_7 + b
predicted_sales_9 = m * week_9 + b

print (f" Predicted sales for the 7th week: {predicted_sales_7: .2f} thousand")
print(f"  ______  " ______ 9th week: {predicted_sales_9: .2f} thousand")
```

```
# Plot the data points and the regression line
plt.scatter(weeks, sales, color='blue', label='Data Points')
plt.plot(weeks, m* weeks + b, color='red', label=f'Linear Regression:
      y = {m:.2f}x + {b:.2f}')
plt.xlabel('Weeks')
plt.ylabel('Sales')
plt.show()
```

O/P::

```
The regression equation is: y = 0.66x + 0.54
Predicted sales for the 7th week: 5.16 thousand
Predicted sales for the 9th week: 6.48 thousand
```

Sales Data and Linear Regression



2. Use matrix approach Linear Regression

xi(week)	yi(sales in thousand)
1	1
2	3
3	4
4	8

code:

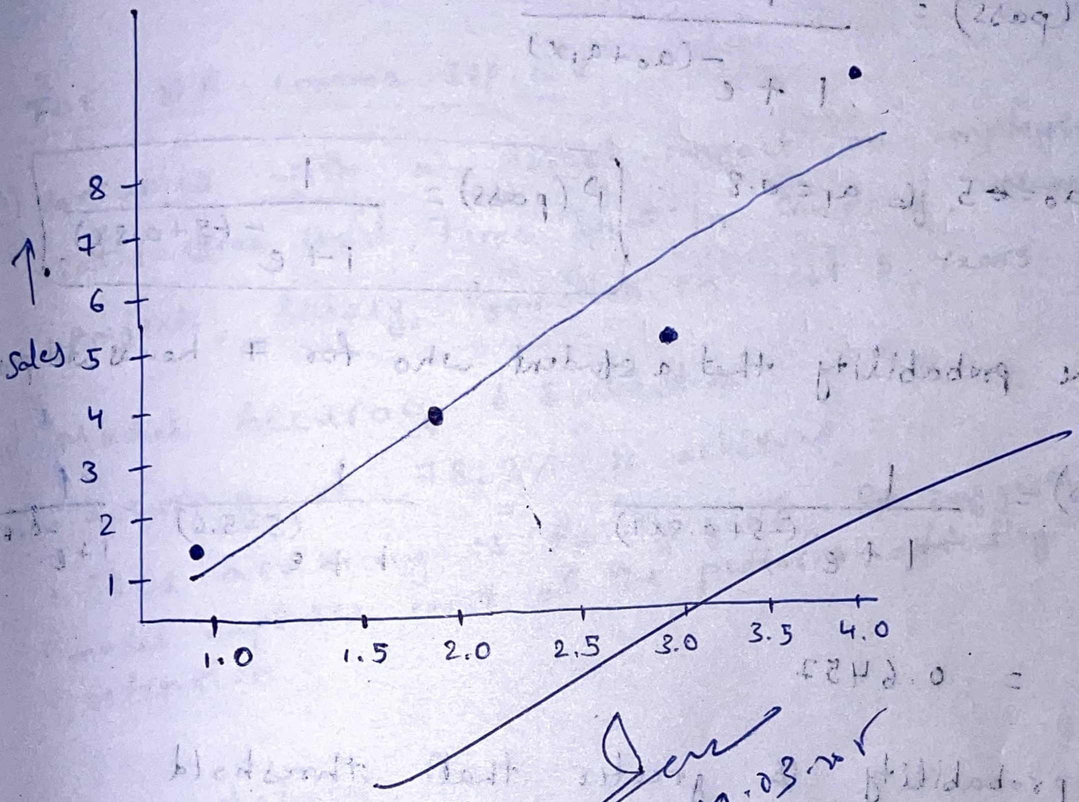
```
df = pd.read_csv('sales2.csv')

weeks = df['xi(week)'].values
sales = df['yi(sales in thousand)'].values

X = weeks.reshape(-1, 1)
Y = sales.reshape(-1, 1)

X_b = np.c_[np.ones((len(X), 1)), X]

#compute θ = ((X^T X)^(-1) X^T).Y
theta = np.linalg.inv(X_b.T.dot(X_b).dot(X_b.T).dot(y)

b = theta[0]
m = theta[1]

print(f"The regression eqn is : y={m[0]:.2f}x + {b[0]:.2f}")

week_5 = 5

predicted_sales_7 = m * week_5 + b

print(f" predicted sales for the 5th week: {predicted_sales_5[0]:
                                         .2f} thousand")
```

Output:

The regression eqⁿ is : $y = 2.20x - 1.50$

predicted sales for the 5th week : 9.50 thousand

Sales Data and Linear Regression



19.03.24