Lab-3

19/3/25

Q1) LINEAR REGRESSION :-

a) Type-1 (Independent & Dependent variable) : (slope method)

→ Using $y = mx + c$ or $y = ax + b$ formula to find the slope & intercept for dataset given below :-

X (weeks)	Y (Sales in thousands)
1	1
2	3
3	4
4	8

* Code :-

→
```
import pandas as pd
data = pd.read_csv('/content/Sales.csv')
x = data['X(weeks)']
y = data['Y(sales)']
x_mean = x.mean()
y_mean = y.mean()
Numerator = ((x-x_mean)*(y-y_mean)).sum()
denominator = ((x-x_mean)**2).sum()
b1 = numerator
     denominator
b0 = y_mean - (b1 * x_mean)
print("Slope (b1):", b1)
print("Intercept (b0):", b0)
x_new = 5
y_predicted = b0 + (b1 * x_new)
print("Predicted value for x=5:", y_predicted)
```

→ Output :

```
Slope (b1): 2.2
Intercept (b0): -1.5
Predicted value for x=5 : 9.5
```

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6) Type-2: Matrix Form

Slope = $a_1 = ((X^T X)^{-1} X^T) Y$

$y = a_0 + a_1 x$

* Code:-

→

```
import numpy as np
import pandas as pd
data = pd.read_csv('/contents/Sales.csv')
x = data['X(weeks)']
y = data['Y(sales)']
x = x.values
y = y.values
X = np.ones((len(x), 2))
X[:, 1] = x
y = y.reshape(-1, 1)
theta = np.linalg.inv(X.T.dot(x)).dot(X.T).dot(y)
b0 = theta[0][0]
b1 = theta[1][0]
print("Slope (b1):", b1)
print("Intercept(b0):", b0)
x_new = 5
y_predicted = b0 + (b1 * x_new)
print("Predicted value for x=5:", y_predicted)
```

→ Output:

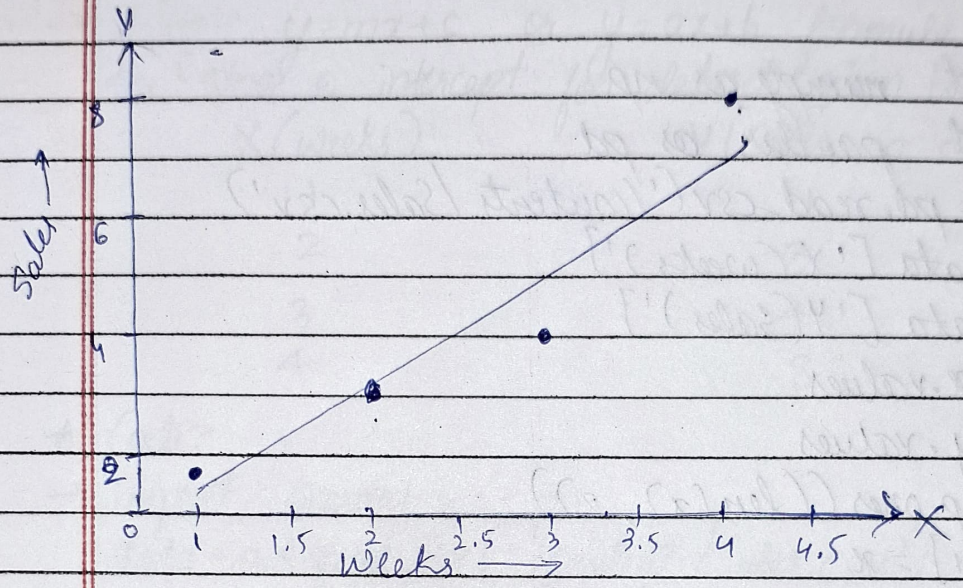
Slope(b1) = 2.200

Intercept(b0) = -1.5

Predicted value for x=5 : 9.500000004

* Plot the graph:-

1. X = 1, 2, 3, 4 Y = 1, 3, 4, 8



2. X = 1, 2, 3, 4 Y = 2, 4, 5, 9