LAB-3 Build Logistic Regression Model 19/03/24

1) Consider a binary classification prob where we want to predict whether a student will pass or fail based on their study hours. The logistic regression model has been trained & the learned parameter are $a_0 = -5$ (intercept) & $a_1 = 0.8$ (coefficient for study hrs)

a- write the logistic regression eq for this problem

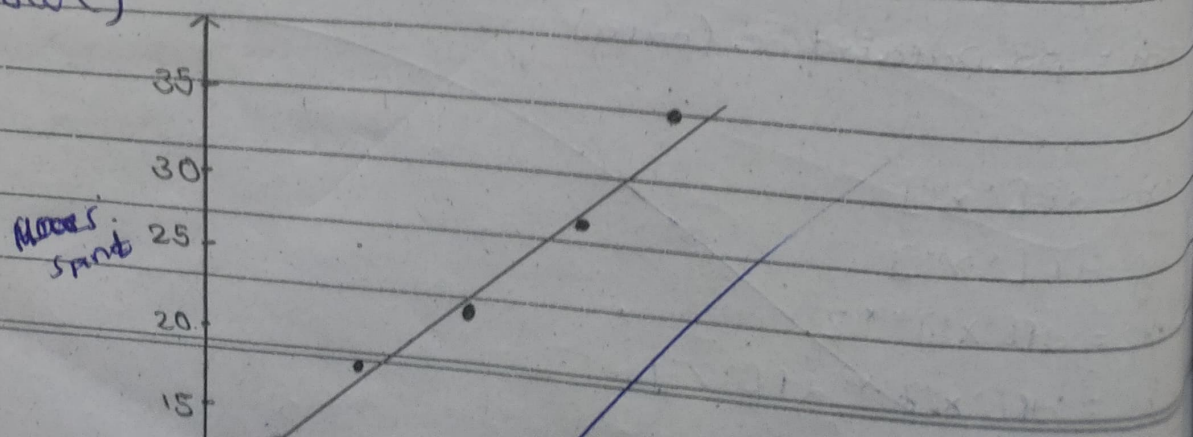
b- Cal the probability that a student who studies for 7hrs will pass

c- Determine the predicted class (pass or fail) for this student based on a threshold of 0.5

1) Linear Regression

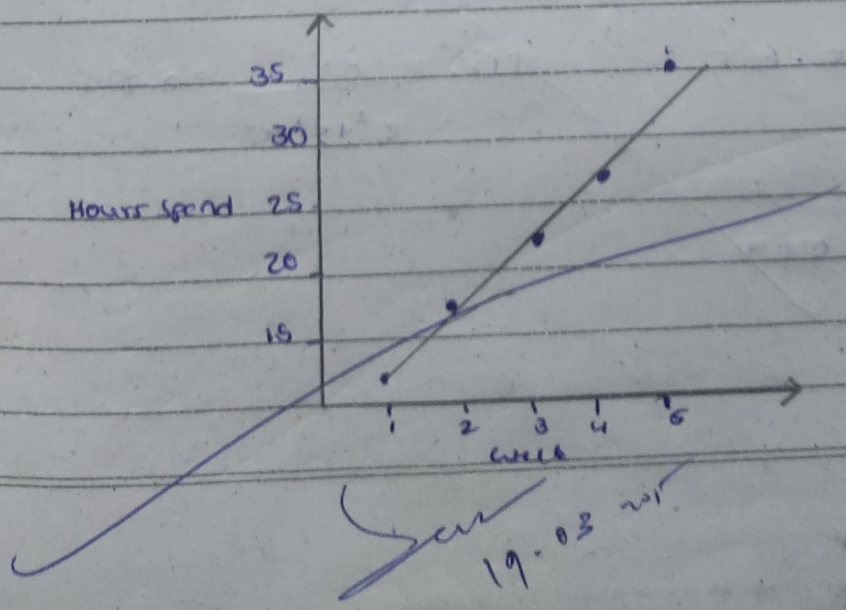
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

data = {
        'x': [1, 2, 3, 4, 5],
        'y': [12, 18, 22, 28, 35]
      }
df = pd.DataFrame(data)

x = df['x']
y = df['y']
x2 = df['x']**2
xy = df['x'] * df['y']
```

```
x_mean = np.mean(x)
y_mean = np.mean(y)
x2_mean = np.mean(x2)
xy_mean = np.mean(xy)

numerator = xy_mean - (x_mean * y_mean)
denominator = x2_mean - (x_mean ** 2)

b1 = numerator / denominator
b0 = y_mean - b1 * x_mean

print("b1:", b1)   # b1 : 5.6000
print("b0:", b0)   # b2 : 6.89

y5 = b0 + b1*5
y7 = b0 + b1*7
print("week 5 :", y5)   # week 5 : 34.2
print("week 7 :", y7)   # week 7 : 45.4

plt.scatter(x, y, label = 'Data Points')
plt.plot(x, b0 + b1 * x, color = 'red', label = 'Regression Li
plt.xlabel('x')
plt.ylabel('y')
plt.title('Regression')
plt.show()
```



Linear Regression using Matrix

```
x = np.column_stack ((np.ones (len(x)), x))
beta = np.linalg.inv (x.T @ x) @ x.T @ y

b0 = beta[0]
b1 = beta[1]

print ("b0 :", b0)          # b0 : 8.60001
print ("b1 :", b1)          # b1 : 6.20002

y5 = b0 + (b1 * 5)
y7 = b0 + (b1 * 7)
print ("week 5 :" y5)       # week 5 : 34.2
print ("week 7 :" y7)       # week 7 : 45.4

plt.scatter (x, y, label = "Data Points")
plt.plot (x, b0 + b1 * x, color = 'red', label = 'Regression line')
plt.xlabel ('X')
plt.ylabel ('Y')
plt.title ('Linear Regression using matrix')
plt.show()
```



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