**Machine Learning (WS 2025/2026)**

**Assignment Sheet 1 – Task 1.3**

**Submitted by: Suvansh Shukla Matriculation No: 256245**

**Assignment 1.3 Answer:**

**Part (A)**

The linear function (straight line) that is given is .

To extrapolate it further, the universal equation for a straight line is: .

This can be re-written for in machine learning terminology as:

Where,

* is the output we are trying to predict
* is the input or the student’s data points, given in the problem statement
* is the weight-1 and its value is 1
* is the weight-0 and its value is 0

The simplified error formula (from the slides) is:

And the formula for calculating is

The formula for calculating is

Now, learning the formula by calculating values for every iteration, i.e. plugging in the values:

* For (1,1)

* For (3,3)

* For (5,4)

* For (7,3)

* For (9,5)

So, after all iterations the function learned is:

**Part (B)**

We can directly calculate the best approximation by finding the minimum of the error function.

This would involve taking partial derivatives of the error function with respect to each weight.

**Part (C)**

Comparing both results we can see that LMS is not as accurate as taking the minimum. This is because 5 data points are not enough for the LMS algorithm to converge properly to the desired values.