**Assignment 5\_1**

**Scenario:**  
You are working as a data analyst for a manufacturing company that tracks production efficiency. The company wants to predict future output based on historical data collected from machine performance. The dataset below shows a consistent relationship between the number of operating hours (x) and the total units produced (y) over several shifts:

| **Operating Hours (x)** | **Units Produced (y)** |
| --- | --- |
| 1 | 3 |
| 2 | 5 |
| 3 | 7 |
| 4 | 9 |
| 5 | 11 |

**Task: Linear Modeling and Neural Network Analysis**

1. **Modeling Production Efficiency:**
   * Based on the dataset, derive the mathematical relationship between operating hours and units produced by fitting a linear model.
   * Write the equation of the line y=mx+c. What do the slope and intercept represent in this context?
2. **Optimizing the Model with Gradient Descent:**
   * Describe how you would apply gradient descent to compute the slope and intercept.
   * Explain how adjusting the **learning rate** influences convergence.
3. How could using **Batch** and **stochastic gradient descent (SGD)** improve the model’s performance for real-time production data?
4. Find the inference after applying both.