Math Assignment-1

From:

AL AZHAR RIZQI RIFA'I FIRDAUS

Class:

2 I

Absence:

01

Student Number Identity:

2241720263

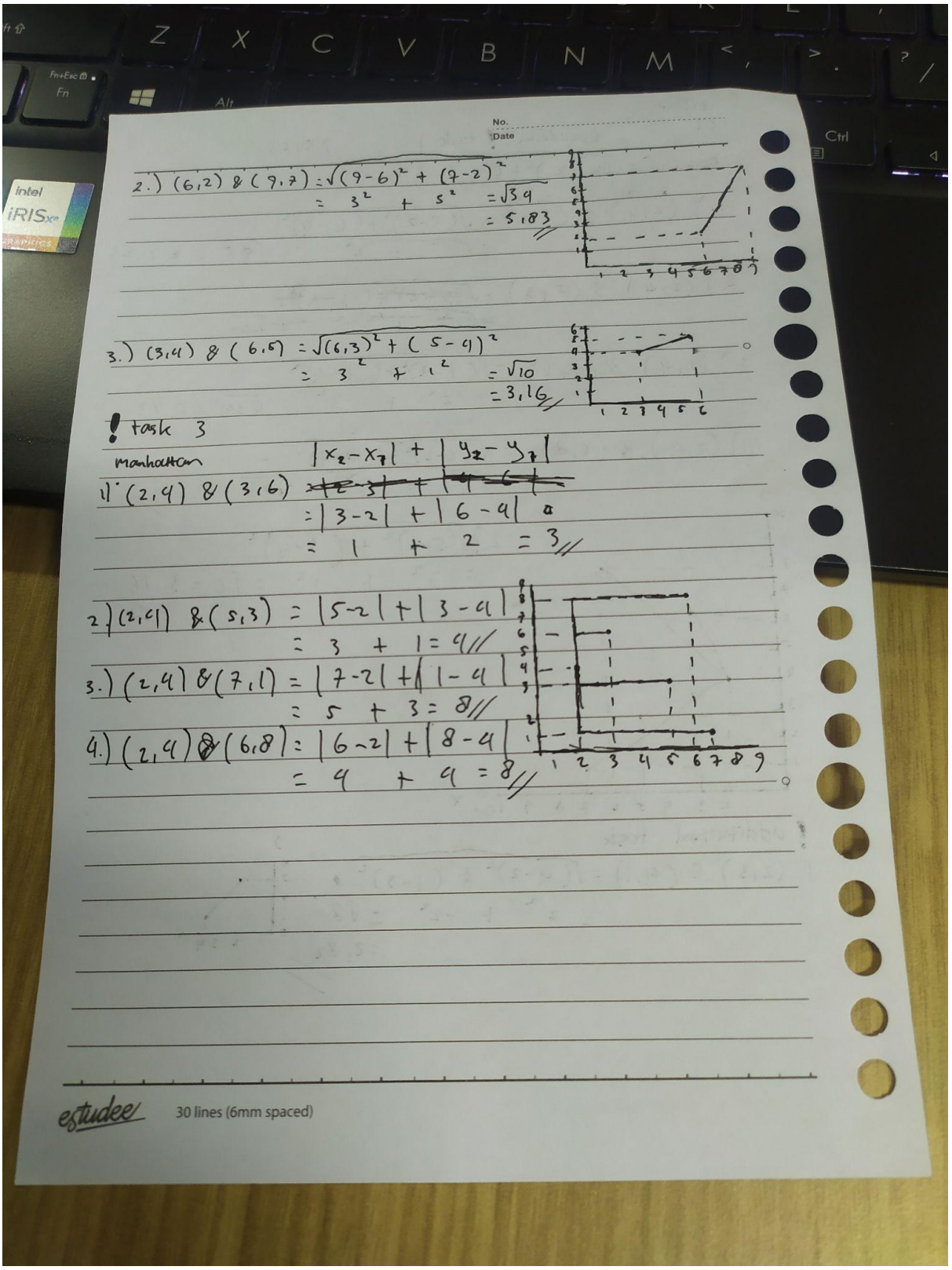
Department:

Information Technology

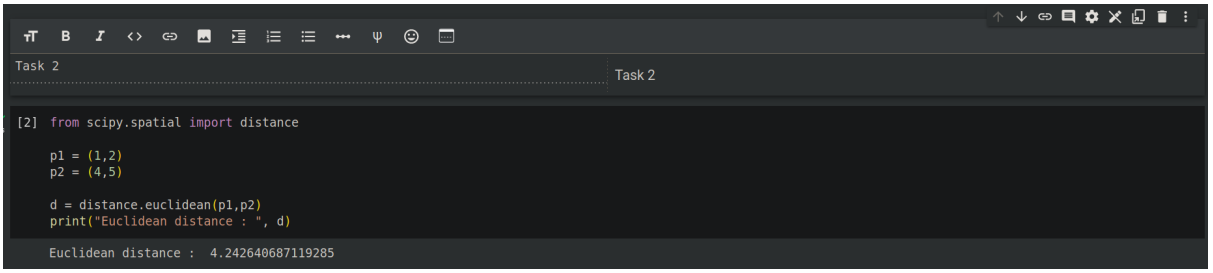
Study Program:

Informatics Engineering

Task 1, additional task, task 3 on paper



Task 2



Task 4

Task 5

Definitions:

Euclidean Distance: Euclidean distance is a measure of the straight-line or "as-the-crow-flies" distance between two points in Euclidean space. It is the most common distance metric and is based on the Pythagorean theorem.

City Block Distance (Manhattan Distance): City block distance, also known as Manhattan distance, calculates the distance between two points by summing the absolute differences between their coordinates along each axis. It mimics the path a person would take when walking in a city grid.

Formulas:

Euclidean Distance in 3 Dimensions:

Euclidean Distance = $\sqrt{((x2 - x1)^2 + (y2 - y1)^2 + (z2 - z1)^2)}$

Euclidean Distance in n Dimensions:

Euclidean Distance = $\sqrt{((x2 - x1)^2 + (y2 - y1)^2 + ... + (xn - x1)^2)}$

City Block Distance in 3 Dimensions:

City Block Distance = $|x2 - x1| + |y2 - y1| + |z2 - z1|$

City Block Distance in n Dimensions:

City Block Distance = $|x2 - x1| + |y2 - y1| + ... + |xn - x1|$

Real-Life Examples:

Euclidean Distance:

GPS Navigation: When you use GPS for driving directions, it calculates the Euclidean distance between your current location and your destination as the shortest path.

Machine Learning: In clustering algorithms like k-means, Euclidean distance is used to determine the similarity between data points. Data points closer in Euclidean space are considered more similar.

City Block Distance (Manhattan Distance):

Taxi Routes: In a city with a grid-like road system, taxi drivers often calculate fares based on the Manhattan distance, as they can only travel along streets that align with the city blocks.

Robotics: When programming a robot to move in a grid-based environment (e.g., a warehouse), the Manhattan distance is used to determine the minimum number of moves needed to reach a target location.

In summary, Euclidean distance measures the straight-line distance between two points in space, while City Block distance measures the distance traveled along grid-like paths. Both have practical applications in various fields, from navigation to data analysis and robotics.