Matematika 3
Euclidian Distance

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Class
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Contents

1 Euclidian Distance

1.1 Task 1

1. $(2,4)$ & $(3,6)$

$$\begin{aligned}(2,4) \text{ \& } (3,6) &= \sqrt{(3-2)^2+(6-4)^2} \\ &= \sqrt{1+4} \\ &= \sqrt{5} \\ &= 2.23\end{aligned}$$

2. $(2,4)$ & $(5,3)$

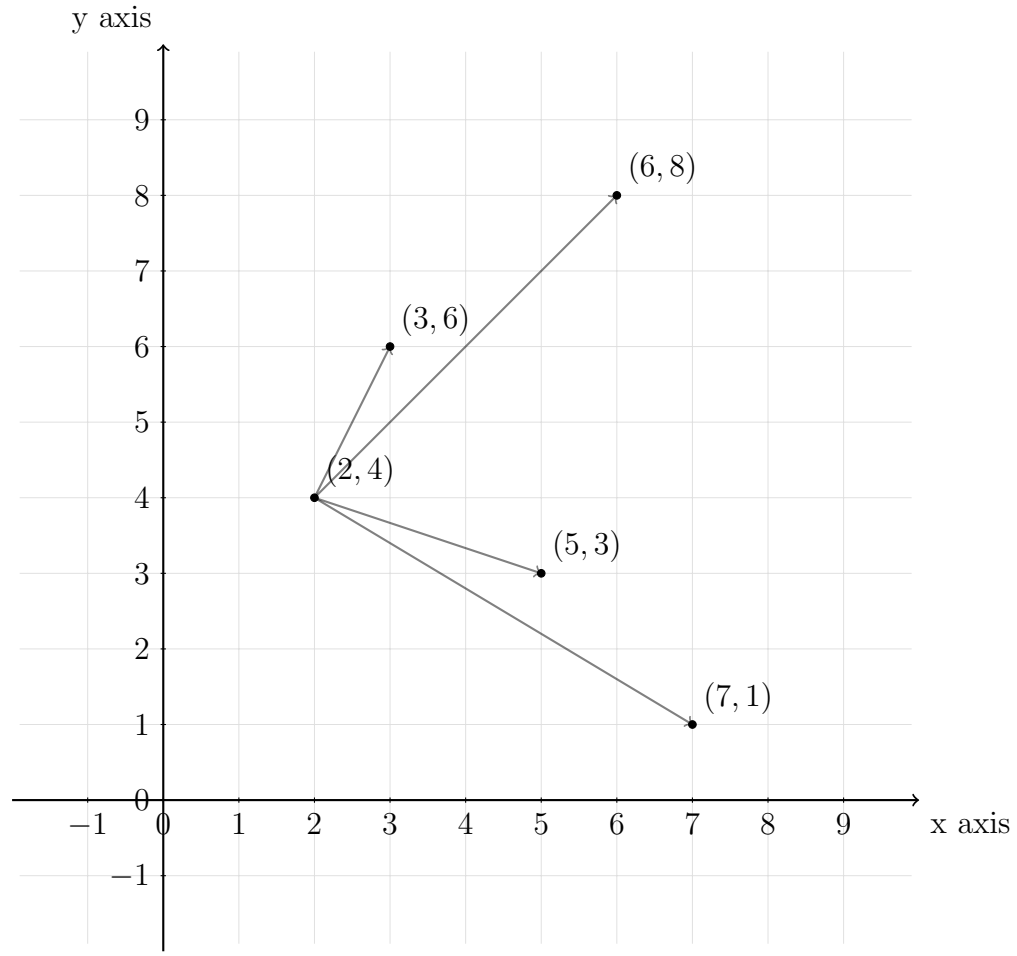
$$\begin{aligned}(2,4) \text{ \& } (5,3) &= \sqrt{(5-2)^2+(3-4)^2} \\ &= \sqrt{9+1} \\ &= \sqrt{10} \\ &= 3.16\end{aligned}$$

3. $(2,4)$ & $(7,1)$

$$\begin{aligned}(2,4) \text{ \& } (7,1) &= \sqrt{(7-2)^2+(1-4)^2} \\ &= \sqrt{25+9} \\ &= \sqrt{34} \\ &= 5.83\end{aligned}$$

4. $(2,4)$ & $(6,8)$

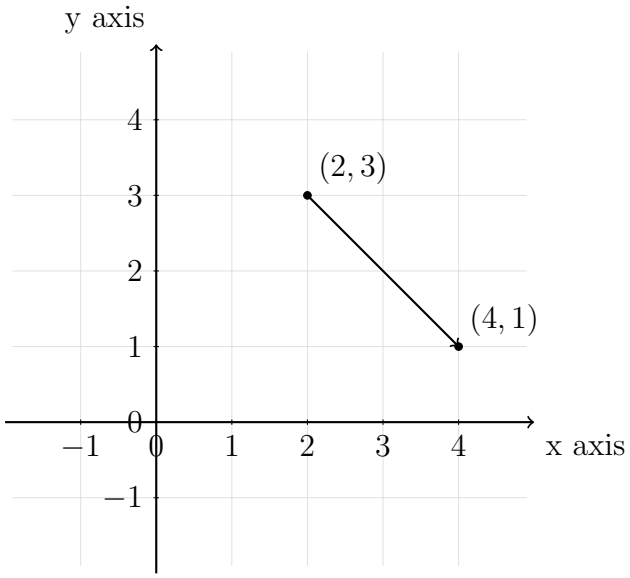
$$\begin{aligned}(2,4) \text{ \& } (6,8) &= \sqrt{(6-2)^2+(8-4)^2} \\ &= \sqrt{16+16} \\ &= \sqrt{32} \\ &= 5.65\end{aligned}$$



1.2 Task 2

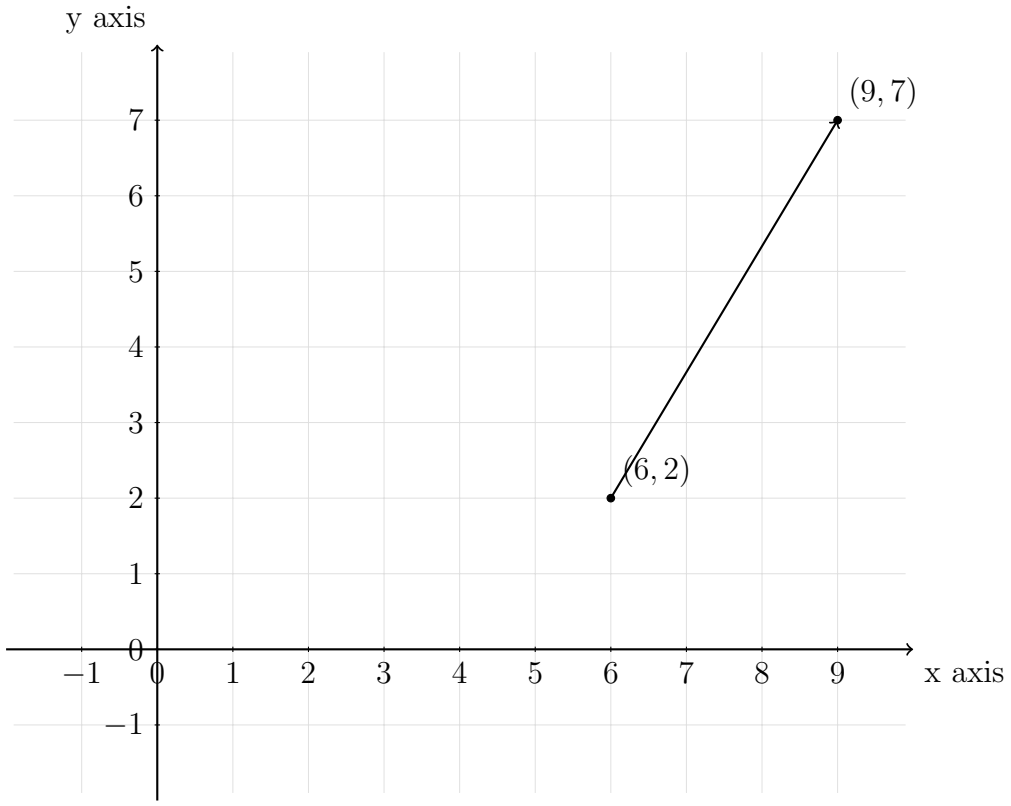
1. $(-1, 2)$ & $(3, 5)$

$$\begin{aligned}(2, 3) \text{ \& } (4, 1) &= \sqrt{(4-2)^2 + (1-3)^2} \\ &= \sqrt{4+4} \\ &= \sqrt{8} \\ &= 2.828\end{aligned}$$


y axis
4
3
2
1
0
−1
−1
0
1
2
3
4
x axis
(2, 3)
(4, 1)

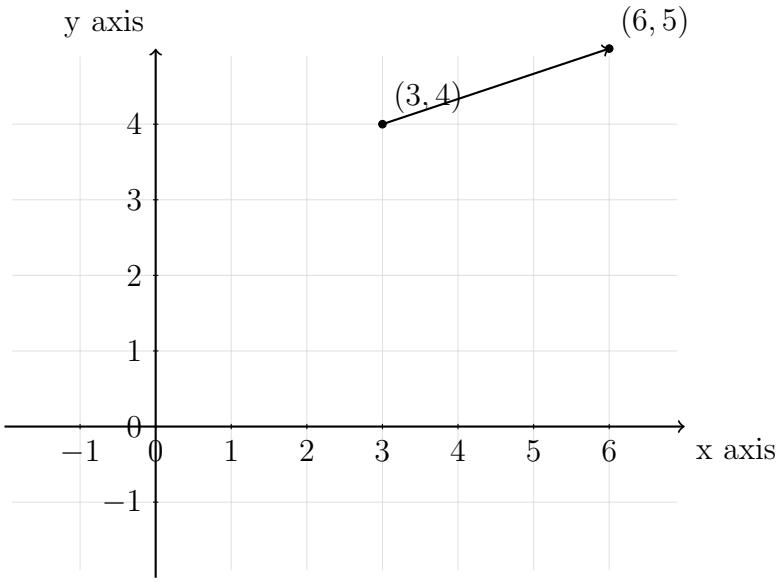
2. $(6, 2)$ & $(9, 7)$

$$\begin{aligned}(6,2) \text{ \& } (9,7) &= \sqrt{(9-6)^2 + (7-2)^2} \\ &= \sqrt{9+25} \\ &= \sqrt{34} \\ &= 5.831\end{aligned}$$



3. $(3, 4)$ & $(6, 5)$

$$\begin{aligned}(3,4) \text{ \& } (6,5) &= \sqrt{(6-3)^2 + (5-4)^2} \\ &= \sqrt{9+1} \\ &= \sqrt{10} \\ &= 3.162\end{aligned}$$



2 Cityblock Distance

2.1 Task 3

1. $(2,4)$ & $(3,6)$

$$\begin{aligned}(2,4) \text{ \& } (3,6) &= |3-2| + |6-4| \\ &= 1+2 \\ &= 3\end{aligned}$$

2. $(2,4)$ & $(5,3)$

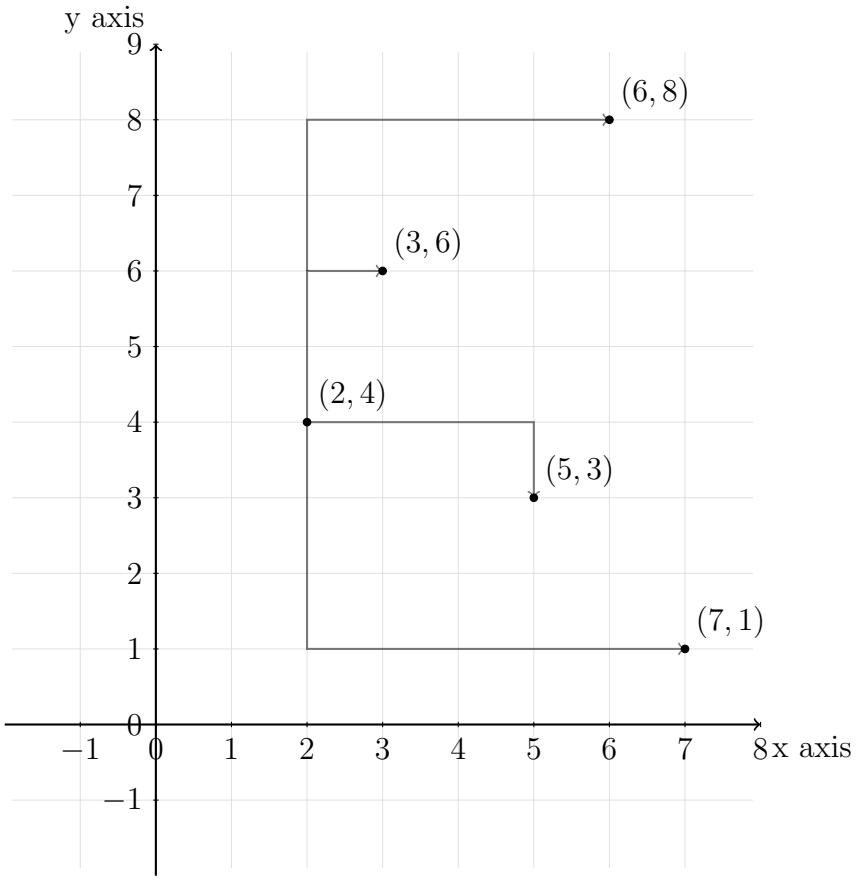
$$\begin{aligned}(2,4) \text{ \& } (5,3) &= |5-2| + |3-4| \\ &= 3+1 \\ &= 4\end{aligned}$$

3. $(2,4)$ & $(7,1)$

$$\begin{aligned}(2,4) \text{ \& } (7,1) &= |7-2| + |1-4| \\ &= 5+3 \\ &= 8\end{aligned}$$

4. $(2,4)$ & $(6,8)$

$$\begin{aligned}(2,4) \text{ \& } (6,8) &= |6-2| + |8-4| \\ &= 4+4 \\ &= 8\end{aligned}$$



2.2 Task 4

```python
import numpy as np

def cityblock_distance(A, B):
    result = np.sum([abs(a - b) for (a, b) in zip(A, B)])
    return result

if __name__ == "__main__":
    array1 = [1, 2, 13, 5]
    array2 = [1, 27, 3, 4]
    result = cityblock_distance(array1, array2)

    print("The CityBlock distance between 2 arrays is: ", result)
```

```
The CityBlock distance between 2 arrays is:  36
```

3 Conclusion

3.1 Task 5

1. Euclidian distance is the distance between two points in a plane. The formula is:

$$d(p, q) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2}$$

2. Cityblock distance is the distance between two points in a plane, but the distance is calculated by the sum of the absolute differences of their Cartesian coordinates. The formula is:

$$d(p, q) = |q_1 - p_1| + |q_2 - p_2|$$

Both of them can be used to find a distance between two points, this can be applied in real life such as finding the shortest distance between two landmarks, clustering, and etc.