**Question 1:**

**Determine if the following function is a proper distance function for P equal to 0.5, 1 and 2, by measuring the distance between (0,0), (0,1) and (1,1)**

**Show your calculations.**



**Answer 1:**

A distance metric or distance function is a real-valued function d, such that for any coordinates x, y, and z:

1. d(x,y) ≥ 0, and d(x,y) = 0 if and only if x = y
2. d(x,y) = d(y,x)
3. d(x,z) ≤ d(x,y) + d(y,z)

**For P = 0.5 = ½**

Distance between (0,0) & (0,1) is: ((|0-0|)1/2 + (|0-1|)1/2)2 = 1

Distance Between (0,1) & (1,1) is: ((|0-1|)1/2 + (|1-1|)1/2)2 = 1

Distance Between (1,1) & (0,0) is: ((|0-1|)1/2 + (|0-1|)1/2)2 = 4

For P = 0.5, This equation is not satisfied 3 distance metrics. So that, It’s not proper distance function.

**For P = 1**

Distance between (0,0) & (0,1) is: ((|0-0|)1 + (|0-1|)1)1 = 1

Distance Between (0,1) & (1,1) is: ((|0-1|)1 + (|1-1|)1)1 = 1

Distance Between (1,1) & (0,0) is: ((|0-1|)1 + (|0-1|)1)1 = 2

For P = 1, This equation is satisfied all the distance metric.

**For P = 2**

Distance between (0,0) & (0,1) is: ((|0-0|)2 + (|0-1|)2)1/2 = 1

Distance Between (0,1) & (1,1) is: ((|0-1|)2 + (|1-1|)2)1/2 = 1

Distance Between (1,1) & (0,0) is: ((|0-1|)2 + (|0-1|)2)1/2 = √2

For P = 2, This equation is satisfied all the distance metric.