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**# Question 1.**

**Is the following function a proper distance function? Why? Explain your answer.**

**Solution:**

The above function is **NOT** a valid distance function as it should satisfy the following properties:

* Property 1: Distance is always non-negative
* Property 2: Commutative, distance from “A to B” is distance from “B to A”
* Property 3: Triangle inequality holds, distance from “A to C” must be less than or equal to distance from “A to B and B to C”

Here, the given equation does not satisfy property 3 for example: Let us take 3 points as follows – A (0,0), B (0,1), C (1,1)

Distance of AB = (|0 - 0|+|0 – 1|) ^2 = 1

Distance of BC = (|0 - 1|+|1 – 1|) ^2 = 1

Distance of AC = (|0 - 1|+|0 – 1|) ^ 2 = 4

**Here, AC > AB + BC which does not satisfy property 3.**

**Measure the distance between (0, 0, 0), (0, 1, 0), (0, 1, 1), and (1, 1, 1)**

**Solution:**

Let A = (0,0,0) B = (0,1,0) C = (0,1, 1) D= (1, 1 ,1)

**Distance formula for a point in 3 Dimension** = **root{(x2-x1) ^2 + {(y2-y1) ^2 + {(z2-z1) ^2}**

Distance between AB = 1

Distance between BC = 1

Distance between CD = 1

Distance between DA = 1.732

Distance between BD = 1.414