1. Is the following a proper distance function? Why? Explain your answer. Measure the distance b/wn $(0,0,0)$ & $(0,1,0)$.

$$d(x,y) = \sum((x_i - y_i)^5)$$

→ Distance function can only be proper function if it follows the following properties –

i) $d(x,y) >= 0$ & $d(x,y) = 0$ if $(x = y)$

ii) $d(x,y) = d(y,x)$

A term can be negative, but the distance can never be negative.

$d(x,y)$ for $(0,0,0)$ & $(0,1,0)$ = $(0-0)^5 + (0-1)^5 +$

(I) — $(0-0)^5 = -1$

$d(y,x)$ for $(0,0,0)$ & $(0,1,0)$ = $(0-0)^5 + (1-0)^5$

(II) — $+ (0-0)^5$

$= 1$

(I) violates property (i) &

(I) ≠ (II); (II) violates property (ii).

Hence $d(x,y) = \sum((x_i - y_i)^5)$ is <u>not a proper distance function</u>.

Distance b/wn $(0,0,0)$ & $(0,1,0)$ = $\sqrt{(0-0)^2 + (0-1)^2 + (0-0)^2}$

$= \sqrt{0 + 1 + 0}$

$= \sqrt{1}$

$= 1$ unit