Midterm Question 1

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I Pledge my Honor That I have Abided by the Stevens Honor System

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Is the following function a proper distance function? Why? Explain your answer. Measure the distance between (0,0,0) and (0,1,0) using the formula below.

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Description automatically generated

1. Calculating distance between x = (0,0,0) and y = (0,1,0)

d(x,y) = ((0-0)^1/3 + (0-1)^1/3 + (0-0))

d(x,y) = (-1)^1/3

d(x,y) = -1

Distance between (0,0,0) and (0,1,0) is -1

1. Calculating distance between x = (0,1,0) and y = (0,0,0)

d(x,y) = ((0-0)^1/3 + (1-0)^1/3 + (0-0))

d(x,y) = (1)^1/3

d(x,y) = 1

Distance between (0,1,0) and (0,0,0) is 1

This function is not a proper distance function. This is because the function violates the property of Non-Negativity. When trying to find the distance between x = (0,0,0) and y = (0,1,0), because x2 is 0 and y2 is 1, (0-1)^1/3=-1. Because the function is to the power of the cubed root, it keeps the negative sign when applied, which should not happen in a proper distance function.