***#1 (10 Points)***

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

d(x, y) = Σ ((xi, yi)3)

* ***Answer:*** The above distance function is not proper and is incorrect because it does not take into account the Z-plane and just considers the XY-plane. So, when we try to measure the distance of the above-mentioned points, this distance function will just calculate the distance between x and y points and not consider z points. So, this distance function is incorrect.

***# 2 (10 Points)***

An employee of a company is traveling to either England, Italy, or Spain. The employee can travel to only one country. There is a 50% chance the employee will go to England and a 20% chance to Italy.

Assume the chances of contracting COVID to be proportional to the prevalence of the disease in each country, given in the table below. For example, the chances of contracting COVID in England is 1200/1,000,000.

Table

Description automatically generated

* ***Answer:*** Given,
* Employee travelling to England, P(E) = 50% = 1/2
* Employee travelling to Italy, P(I) = 20% = 1/5
* Employee travelling to Spain, P(S) = 30% = 3/10
* Chances of contracting COVID in England, P(C|E) = 1200/1,000,000 = 3/2500
* Chances of contracting COVID in Italy, P(C|I) = 1500/1,000,000 = 3/2000
* Chances of contracting COVID in Spain, P(C|S) = 1600/1,000,000 = 1/625

1. **What are the chances that the employee will contract COVID while travelling?**

* So, chances that the employee will contract COVID while travelling,

P(C) = P(E)\*P(C|E) + P(I)\*P(C|I) + P(S)\*P(C|S)

= (1/2) \* (3/2500) + (1/5) \* (3/2000) + (3/10) \* (1/625)

= 3/5000 + 3/10000 + 3/6250

= 69/50000

P(C) = 0.138%

1. **Assume that the employee has traveled to Europe and contracted COVID, what is the probability that he/she traveled to England?**

* So, we need to find, P(E|C)

Now, P(C|E) = P(C ∩ E) / P(E)

∴ P(C ∩ E) = P(C|E) \* P(E)

∴ P(C ∩ E) = (3/2500) \* (1/2)

∴ P(C ∩ E) = 3/5000

Hence, P(E|C) = P(C ∩ E) / P(C)

∴ P(E|C) = (3/5000) / (69/50000) …{From Question I.}

∴ P(E|C) = 10/23

∴ P(E|C) = 43.48%