CSC240 Problem Set 1

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1. a)

Exists n st. all indices after n in S are distinct pair-wise.

b)

If $(S_n)_{n=1}^{\infty} \in \mathbb{Z}^{\infty}$ st. $S_n := n$ then the statement is true.

c)

If $(S_n)_{n=1}^{\infty} \in \mathbb{Z}^{\infty}$ st. $S_n := 1$ then the statement is false.

2.

$UScitizen(x) = $ "Traveller x is a US citizen" corresponds to "All air travellers who are not US citizens."

$FVaccinated(x) = $ "Traveller x is fully vaccinated" corresponds to "required to be fully vaccinated."

$Proof(x) = $ "Traveller x has provided proof of vaccination status" corresponds to "provide proof of vaccination status prior to boarding."

$OverTwo(x) = $ "Traveller x's age is greater than equal to 2" corresponds to "All airline passengers to the United States ages two years and older."

$CovidNeg(x) = $ "Traveller x provided negative COVID-19 viral test taken within one day" corresponds to "must provide a negative COVID-19 viral test taken within one calendar day of travel."

$Document(x) = $ "Traveller x has provided documentation from a licensed health care provider of having recovered from COVID-19 90 days prior"

corresponds to "travellers to the United States may provide documentation from a licensed health care provider of having recovered from COVID-19 in the 90 days preceding travel."

$Air(x) =$ "Traveller x is travelling by plane" corresponds to "Air travellers."

$Allowed(x) =$
($\text{NOT}_1 UScitizen(x)$ $\text{IMPLIES}_2 (Air(x)$ $\text{AND}_3 FVaccinated(x))$ $\text{OR}_4 ($ $\text{NOT}_5 Air(x)$ $\text{AND}_6 Proof(x)))$ $\text{AND}_7 (OverTwo(x)$ $\text{IMPLIES}_8 CovidNeg(x)$ $\text{OR}_9 Document(x))$

NOT_1 is because these are only conditions if the traveller is not a US citizen.
IMPLIES_2 is because if the person is not a US citizen they have to comply with the following two conditions.
AND_3 is because air travellers need to be fully vaccinated.
OR_4 is because this is the alternative conditional for non US-citizens.
NOT_5 is because either $Air(x)$ is true or false; this is the false option.
AND_6 is because if the traveller is not taking a plane they must follow a different condition. I am just assuming that land ports of entry and ferries are the only other ways of entering the US.
AND_7 is because these are the other conditions regardless of the traveller being a US citizen or not.
IMPLIES_8 is to specify these conditions only to travellers over or equal to the age of two.
OR_9 is because there are two conditions.

We are also specifying our domain for *Allowed* to only travellers entering the US, because that is the only situation where a US immigration officer makes sense.