Proof Notebook Problem 4

The Problems:

1. Let A_i be sets for $i \in \mathbb{Z}_{\geq 0}$. Suppose $A_{i+1} \subseteq A_i$ for all indices i. Show that:
$$\bigcup_{i=0}^{\infty} A_i = A_0$$
2. Let A_i be sets for $i \in \mathbb{Z}_{\geq 0}$. Suppose $A_i \subseteq A_{i+1}$ for all indices i. Show that:
$$\bigcap_{i=0}^{\infty} A_i = A_0$$
3. Find an example of some sets A_i, $i \in \mathbb{Z}_{\geq 0}$ such that $A_i \subset A_{i+1}$ and $A_i \subseteq \mathbb{R}$ but not $\bigcup_{i \in \mathbb{Z}_{\geq 0}} A_i = \mathbb{R}$.

   Prove that under these conditions, your A_i's satisfy $\bigcup_{i \in \mathbb{Z}_{\geq 0}} A_i \neq \mathbb{R}$

Please do not do multiple problems: you should have a clear mind for the peer review.
Only use the third problem if you're in a group of three.

Due Dates:

Item	Due Date	Method
Draft 1	Friday, October 3 (10pm)	Blackboard
Peer Review 1	Before 2nd draft	On your own – nothing to turn in
Draft 2	Tuesday, October7	In class
Draft 3	Friday, October 10 (10pm)	Blackboard
Peer Review 2	Before final version	On your own – upload peer review worksheet to Blackboard.
Final Version	Tuesday, October 14	In class

The peer review process:

1. Schedule a time to meet in pairs or groups of 3. Come to the meeting with draft 1 completed.
2. Person 1 presents their proof on the board; Person 2 analyzes each step:
    1. Is this step intelligible or nonsense?
    2. Does this step say what the Person 1 thinks it says?
    3. Does this step follow from the previous steps?
    4. Is it clear why this step follows?
3. Switch roles and repeat (2).