Before writing your answers to these questions, think about the following:
There is – or there is not – room on this sheet of paper to neatly write your solutions.
(Sometimes there will be, sometimes not.)

Background. Skip to Problem 3 for work to be done.

1. Similar to Lesson 32.1: Suppose that you are given a characteristic function
   \( \chi_A : S \rightarrow \mathbb{R} \) and a set \( P \), and someone asks you to prove that the pre-image
   \( \chi_A^{-1}(1) = P \).

   [As noted in previous work, there are two parts to the proof.]

2. Now, focus on ONE of the two steps described above.
   On your paper write
   To prove: \( \chi_A^{-1}(1) = P \)
   then write
   Proof. First, we will prove that ... and state ONE of the two things you’re supposed to prove.
   Then GIVE A REASONABLE FIRST SENTENCE TO START THE PROOF OF THIS.

Now, do this.

3. Let’s think about how we prove that every element of \( \chi_A^{-1}(1) \) is in \( P \). In the SECOND step of
   this, we will finally get around to using the definition of the pre-image. Write the following as
   indicated:
   Write this: Proof. First, we will prove that ...
   1. Give a reasonable first sentence, as in Problem 2 above.
   2. Next, USE THE DEFINITION OF PRE-IMAGE (not the definition of characteristic function) to draw
      a conclusion.
   3. Now, USE THE DEFINITION OF THE SPECIFIC FUNCTION \( \chi_A \) (not the definition of pre-image) to draw a conclusion.

   So far, the set \( P \) should not have appeared in your argument.

   By the way, I numbered the steps above for convenience. You should NOT number the steps in your
   proof. The point of this is to get you to THINK about how to do a proof, not to give you a template to
   copy when doing a proof.