Part I: Read and Respond (prepare for class Friday, January 17)

First, answer the email I'm sending on Wednesday afternoon (it won't be sent until probably 3 PM, so maybe this will not be first for you if you're looking at this assignment before then) as soon as possible so I can assign your partner for pair problems.

Also, carefully read the rest of Section 1.2 , taking notes for yourself and answering the following questions. Much of this material should be review from previous math classes. Review the syllabus for parts (a)–(c) that should be included in this assignment.

Note: Abbott has a somewhat annoying habit of writing the word "Proof." followed by a paragraph (or 2 or 3) of explanation before the proof actually starts. As good as this book is, that's not a model I want you to follow with your proofs. So feel free to label the beginning of each proof in your own book at where the proof actually starts.

Here are the reading questions for part (a):

Reading Questions

1. Where have you seen proof by contradiction in other classes?
2. Where have you seen proof by contrapositive in other classes?
3. In the proof of Theorem 1.2.6, Abbott says that $|a - b| = \epsilon_0$ and $|a - b| < \epsilon_0$ cannot both be true. Why not?
4. Do you remember how induction works?

Part II: Exercises (prepare for class for Friday, January 17)

1. Prove or disprove Sam's Conjecture: $||a + b| - c| \leq ||a| + |b| - c|$ for $a, b, c \in \mathbb{R}$. If you disprove it, revisit Exercise 1.2.6d and find another proof for the result there that does not use Sam's Conjecture. If you prove it, make sure you're happy with how to use it to prove 1.2.6d.
2. Exercise 1.2.10
3. Exercise 1.2.11

Part III: Problems (due Wednesday, January 22 at the beginning of class)

1. (P) In class Wednesday (January 15), we talked about how we cannot modify the proof of $\sqrt{2}$ being irrational to show that $\sqrt{4}$ is irrational. This, of course, was good news since we know that $\sqrt{4} = 2$, which is a rational number. We also discussed ways to modify the proof that $\sqrt{2}$ is irrational to show that $\sqrt{3}$ and $\sqrt{6}$ are also irrational. Now consider how the proof would change if we want to show that $\sqrt{8}$ is irrational. What about $\sqrt{45}$? What about $\sqrt{n}$, where n is a nonnegative integer? For

each case, you do not need to rewrite the entire proof; just explain where and how you would change the proof from the $\sqrt{2}$ case.