

Please submit your solutions into the box marked “CS 19 Homework In” at the main entrance of Sudikoff.

You must demonstrate how you arrived at your final answers — i.e., you must show your steps — unless the problem statement makes an exception. You must also justify any steps that are not trivial. Simply writing down a final answer *will not earn any credit*. Please think carefully about how you are going to organise your answers *before* you begin writing.

The notation $P_{i,j-k}$ refers to Problem k from the list of problems after Section i,j in your textbook. Thus, $P_{1.2-4}$ refers to Problem 4 on page 17.

1. Solve $P_{1.2-4}$. [5 points]
2. Solve $P_{1.2-6}$. [10 points]
3. Solve $P_{1.2-7}$; note that a “five-digit number” must lie between 10000 and 99999 inclusive. [10 points]
4. Solve $P_{1.2-8}$. [10 points]
5. Solve $P_{1.2-13}$. [10 points]
6. Solve $P_{1.2-15}$. [15 points]
7. Let $f : A \rightarrow B$ be a function and suppose $|A| = |B| = n$. Prove that
 f is injective $\iff f$ is surjective.

[15 points]

Note: The above problem asks you to “explain” a fact, i.e., write a proof of a certain statement. In this case, the statement is an “if and only if” statement, so your proof should be neatly divided into two clearly marked parts, organized as follows. In the first part, prove the “ \implies ” direction: start by assuming that f is injective. Then make a sequence of logical deductions that end in the conclusion that f is surjective. *Avoid writing a lengthy paragraph or overlong sentences!* Stick to short, crisp sentences. In the second part, prove the “ \impliedby ” direction: start by assuming that f is surjective and eventually conclude that f is injective.

You can title the two parts as you like. One convention simply titles them “ \implies ” and “ \impliedby ”.

8. Solve $P_{1.3-2}$. You need not show any steps. [5 points]
9. Solve $P_{1.3-3}$, part (c). [10 points]
10. Solve $P_{1.3-8}$. [10 points]