CS182 – Foundations of Computer Science

PSO sessions 1 and 2, week of January 20, 2020

PSO 1

Task 1. Meet and greet the students. Introduce yourself; write on the board the times of the PSO sessions for this particular group. Also, write your email.

For each of the following problems, give the students a few minutes (say 4-5 minutes) first to think about it and try to solve it on their own. Then, solve it on the board for them; do not use slides, they need to see the derivations slowly.

Problem 1. (Solve without using truth tables.) Determine whether $p \to (q \to r)$ and $p \to (q \wedge r)$ are equivalent.

Problem 2. Prove that $(q \wedge (p \to \neg q)) \to \neg p$ is a tautology using propositional equivalence and the laws of logic.

Problem 3. Write the contrapositive, converse, and inverse of the following: If you try hard, then you will win.

Task 2. If there is time left, use it as office hours and let the students ask any questions they might have.

PSO 2

For each of the following problems, give the students a few minutes (say 4-5 minutes) first to think about it and try to solve it on their own. Then, solve it on the board for them; do not use slides, they need to see the derivations slowly.

Problem 1. Suppose that $Q(x)$ is "$x + 1 = 2x$", where x is a real number. Find the truth value of the statements: $Q(2)$, $\forall x\ Q(x)$, $\exists x\ Q(x)$.

Problem 2. Let $P(x, y)$ mean "$x + 2y = xy$", where x and y are integers. Determine the truth value of the statements: $\exists y\ P(3, y)$, $\forall x \exists y\ P(x, y)$, $\exists x \forall y\ P(x, y)$, $\forall y \exists x\ P(x, y)$, $\exists y \forall x\ P(x, y)$.

Problem 3. Suppose the variable x represents students and the variable y represents courses, and "$A(y)$: y is an advanced course", "$S(x) : x$ is a sophomore", "$F(x) : x$ is a freshman", "$T(x, y) : x$ is taking y". Write the following statements using these predicates and any needed quantifiers: "There is an advanced course that every freshman is taking", "No freshman is a sophomore", "Some freshman is taking an advanced course".

Task 1. If there is time left, use it as office hours and let the students ask any questions they might have.