CSE2315: Homework 2 Out: Feb. 2 Due: Feb 18.

- 1. (10 points) Symbolize the following argument: Every ambassador speaks only to diplomats. Some ambassador speaks to someone. Therefore, there is a diplomat.
- 2. (10 points) Consider the following verbal argument: If John took the necklace or the janitor lied, then a crime was committed. Robert was not in town. If a crime was committed, then Robert must have been in town. Therefore, John did not take the necklace. Should a jury buy this argument?
- 3. (10 points) Consider the following verbal argument: If the program is efficient, it executes quickly. Either the program is efficient, or it has a bug. However, the program does not execute quickly. Hence it has a bug. Is the argument valid?
- 4. (30 points) Prove that the following arguments are valid:
 - (a) $[(A' \lor B) \land (B \to C)] \to (A \to C)$
 - (b) $[A \to (A \to B)] \to (A \to B)$
 - (c) $[((A \lor B') \to C) \land (C \to D) \land A] \to D$
 - (d) $[A' \land (A \lor B)] \to B$
 - (e) $[P \lor (Q \land R)] \to (P \lor Q)$
 - (f) $[[P \to (Q \to R)] \land (P \lor S') \land Q] \to (S \to R)$
- 5. (10 points) Give interpretations to prove that the following wffs are not valid:
 - (a) $(\exists x)A(x) \land (\exists x)B(x) \rightarrow (\exists x)[A(x) \land B(x)]$
 - (b) $(\forall x)(\exists y)P(x,y) \to (\exists x)(\forall y)P(x,y)$
- 6. (10 points) Is the following argument valid: $[(\forall x)P(x) \land (\exists x)Q(x)] \rightarrow (\exists x)[P(x) \land Q(x)].$
- 7. (10 points) Prove that the following argument is valid: $(\forall x)P(x) \to (\forall x)[P(x) \lor Q(x)]$.
- 8. (10 points) Consider the following assertion: There is an astronomer who is not nearsighted. Everyone who wears glasses is nearsighted. Furthermore, everyone either wears glasses or wears contact lenses. Therefore, some astronomer wears contact lenses. Is the assertion a valid argument?