

Extra Credit for Midterm Exam

CS101a

October 26, 2007

1 Logic

1. Prove the sequents below:

a. $p \rightarrow (q \vee r), q \rightarrow s, r \rightarrow s \vdash p \rightarrow s$

b. $p \rightarrow q, r \rightarrow s \vdash p \wedge r \rightarrow q \wedge s$

2. Use resolution to show that the database of terms below is unsatisfiable. Show your steps.

a. $\{P \vee \neg Q, P \vee R, \neg Q \vee R, \neg P \vee Q, Q \vee \neg R, \neg P \vee \neg R\} \vdash \perp$

3. Convert the following first-order expressions to Conjunctive Normal Form. The expression may result in several clauses. List them each separately; e.g., $P(x) \wedge Q(x)$ is two clauses, $\{P(x1)\}$ and $\{Q(x2)\}$.

a. $\neg \exists x \forall y [[P(x, y) \wedge Q(y) \rightarrow [R(y, x) \vee \neg T(y)]]]$

b. $\forall y \exists x [P(x) \vee Q(y) \rightarrow R(y)]$