CSC 503 Homework Assignment 5

Out: September 11, 2015
Due: September 18, 2015
MISSING-ID

In using the Fitch macros to typeset proofs in first order logic, one introduces a dummy variable x by means of the command `\open[x]`.

1. [10 points] Using only the basic natural deduction rules, find a proof for

$$\forall x(P(x) \to Q(x)) \vdash \forall x P(x) \to \forall x Q(x).$$

2. [20 points] Using only the basic natural deduction rules, find a proof for

$$\forall x \forall y P(x, y) \vdash \forall u \forall v P(u, v).$$

3. [35 points] Using only the basic natural deduction rules, find a proof for

$$\exists x(\neg P(x) \vee Q(x)) \vdash \exists x \neg(P(x) \wedge \neg Q(x)).$$

4. [35 points] Using only the basic natural deduction rules, find a proof for

$$\forall x \forall y \forall z[S(x, y) \wedge S(y, z) \to S(x, z)], \forall x \neg S(x, x) \vdash \forall x \forall y[S(x, y) \to (\neg S(y, x) \vee S(x, x))]$$