

Formale Systeme Proseminar

Tasks for Week 10, 6.12.2018

Task 1 Show with derivations that the following formula is a tautology

$$\exists x \forall y [P(x) \Rightarrow Q(y)] \Rightarrow (\forall u [P(u)] \Rightarrow \exists v [Q(v)])$$

Task 2 Prove with a derivation that the following formula is a tautology.

$$\exists y [\forall x [P(x) \wedge Q(x, y)]] \Rightarrow \forall z [P(z)]$$

Task 3 Prove with a derivation that the following formula is a tautology.

$$\forall y [Q(y) \Rightarrow (P(y) \Rightarrow \exists x [P(x) \wedge Q(x)])]$$

Task 4 Prove with a derivation that the following formula is a tautology.

$$\forall x [P(x) : Q(x)] \Rightarrow (\exists x [P(x)] \Rightarrow \exists x [Q(x)])$$

Also prove it with a calculation.

Task 5 Prove with a derivation that the following formula is a tautology.

$$\exists x [\forall y [P(x, y)]] \Rightarrow \forall v [\exists u [P(u, v)]]$$