Logic and Verification – due April 1, 2003

1. Give a deduction (from $\emptyset$) of $(\forall x\, \phi) \to \exists x\, \phi$.

2. (Re-replacement lemma)

   (a) (a) Show by example that $(\phi^x_y)^y_x$ is not in general equal to ϕ. Show that it is possible both for x to occur in $(\phi^x_y)^y_x$ at a place where it does not occur in ϕ, and for x to occur in ϕ at a place where it does not occur in $(\phi^x_y)^y_x$

not occur at all in ϕ, then x is substitutable for y in ϕ^x_y and $(\phi^x_y)^y_x = \phi$.
duction on ϕ.

ity of equality follows from the axioms, that is, $\vdash \forall x\, \forall y\, \forall z\, (x = y \to$

ps 3 and 4 are valid.

f the following two statements.

ϕ.

of formulas is satisfiable.

$, Pv_2, Pv_3, \ldots\}$. Is Γ consistent? Is Γ satisfiable?