

Useful Equivalences

$\forall x(\neg\varphi)$	\Leftrightarrow	$\neg\exists x\varphi$	
$\exists x(\neg\varphi)$	\Leftrightarrow	$\neg\forall x\varphi$	
$(\forall x\varphi(x)) \wedge (\forall y\psi(y))$	\Leftrightarrow	$\forall x(\varphi(x) \wedge \psi(x))$	if $x \notin \text{FREE}(\psi)$
$(\exists x\varphi(x)) \vee (\exists y\psi(y))$	\Leftrightarrow	$\exists x(\varphi(x) \vee \psi(x))$	if $x \notin \text{FREE}(\psi)$
$\forall x\varphi$	\Leftrightarrow	φ	if $x \notin \text{FREE}(\varphi)$
$\exists x\varphi$	\Leftrightarrow	φ	if $x \notin \text{FREE}(\varphi)$
$\forall x(\varphi \vee \psi)$	\Leftrightarrow	$(\forall x\varphi) \vee \psi$	if $x \notin \text{FREE}(\psi)$
$\exists x(\varphi \wedge \psi)$	\Leftrightarrow	$(\exists x\varphi) \wedge \psi$	if $x \notin \text{FREE}(\psi)$