Math 2110

Homework #4

Name: My Name Goes Here

Please use ${\rm \sc larger} X$ to type up this homework set!

#1 I have provided the proof of Lemma K19 - it's just missing justifications for each line. Please fill in the justifications.

Lemma K19: $\neg \forall x A(x) \vdash_K \exists x \neg A(x)$	
1: $\neg \forall x A(x)$	<u>1: Given</u>
2: $\neg \neg A(x) \rightarrow A(x)$	<u>2: ?????</u>
3: $\forall x (\neg \neg A(x) \rightarrow A(x))$	<u>3: ?????</u>
4: $\forall x (\neg \neg A(x) \rightarrow A(x)) \rightarrow (\forall x \neg \neg A(x) \rightarrow \forall x A(x))$	<u>4: ?????</u>
5: $\forall x \neg \neg A(x) \rightarrow \forall x A(x)$	<u>5: ?????</u>
6: $(\forall x \neg \neg A(x) \rightarrow \forall x A(x)) \rightarrow (\neg \forall x A(x) \rightarrow \neg \forall x \neg \neg A(x))$	<u>6: ?????</u>
7: $\neg \forall x A(x) \rightarrow \neg \forall x \neg \neg A(x)$	<u>7: ?????</u>
8: $\neg \forall x \neg \neg A(x)$	<u>8: ?????</u>
9: $\exists x \neg A(x)$	<u>9: ?????</u>

#2 Prove the following lemmas: K7, K13, K16, and K32.

Lemma K7:	$\vdash_{K} \forall x \left(A(x) \to B(x) \right) \to \left(\forall x A(x) \to \forall x B(x) \right)$
Lemma K13:	$\vdash_K \forall x A(x) \to \exists x A(x)$
Lemma K16:	$\neg \exists x A(x) \vdash_K \forall x \neg A(x)$
Lemma K32:	$\vdash_{K} (\forall x A(x) \land \exists x B(x)) \to \exists x (A(x) \land B(x))$

Template Proof Code: If we use the Deduction Theorem our proof looks something like this...

Consider $stuff \vdash_L stuff$. **Proof:**

1:	???	<u>1:</u>	???
2:	???	2:	???

By the Deduction Theorem blah blah.

Otherwise, our proof could just look like this...

1:	???	<u>1: ??</u>	?
2:	???	2: ??	?