LAB-8

First Order Logic

Statement: If all birds can fly, kiwis are birds, and kiwis cannot fly, then not all birds can fly.

Step 1: FOL Representation

1. All birds can fly

$$\forall x, (Bird(x) \rightarrow CanFly(x))$$

For all x, if x is a bird, then x can fly

2. Kiwis are birds

$$\forall x (Kiwi(x) \rightarrow Bird(x))$$

For all x, if x is a kiwi, x is a bird

3. Kiwis cannot fly

$$\forall x (Kiwi(x) \rightarrow \neg CanFly(x))$$

For all x, if x is a kiwi, then x cannot fly.

To prove not all birds can fly

1. Premise 1: All birds can fly

$$\forall x \, (Bird(x) \rightarrow CanFly(x))$$

If x is a bird, x can fly

2. $\forall (Kiwi(x) \rightarrow Bird(x))$

Kiwis are birds

3. $\forall x (Kiwi(x)) \rightarrow \neg(CanFly(x))$

$$\forall x \, (Kiwi(x)) \rightarrow \neg(CanFly(x))$$

From $\forall x (Kiwi(x) \rightarrow Bird(x))$, any instance of kiwi is a bird

i.e   Kiwi(clara) implies Bird (clara)

From Premise 3 $(\forall x (Kiwi(x) \rightarrow \neg CanFly(x))$
Kiwis cannot fly.

x is a kiwi, then x is a bird, but x cannot fly contradicting premise 1, which states all birds can fly.

∴ E x which is a bird that cannot fly

∴ $\neg \forall x (Bird(x) \rightarrow CanFly(x))$

Premise 1

$$Bird(x) \rightarrow CanFly(x) \qquad Kiwi(x) \rightarrow \neg(CanFly(x))$$

$$Kiwi(x) \rightarrow Bird(x)$$

Proceed

Output:

All birds can fly

Penguins are birds

Penguins cannot fly

Premise 1