INFO I201
Homework 5

Due 05/28.

- **Reading assignment**: Chapter 2 and beginnings of Chapter 3 of the book.
- **Computer problems**: Problems 2.11-2.17 from Tarski's World. Nothing to turn in.
- **Regular problems**:

1. Give natural deduction proofs for the following sequents:

   (a) $P \longrightarrow Q, P, Q \longrightarrow P \vdash (P \longrightarrow Q) \wedge (Q \longrightarrow P)$

   (b) $P \longrightarrow Q, P, Q \longrightarrow P \vdash \neg P \longrightarrow \neg Q$

   (c) $\neg(P \longrightarrow Q) \vdash \neg Q$

   (d) $P \longrightarrow Q, \neg\neg P \vdash Q$

   (e) $(P \longrightarrow \neg Q) \wedge (Q \longrightarrow \neg R), S \longrightarrow Q \vdash S \longrightarrow (\neg P \wedge \neg R)$

   (f) $\neg(P \longrightarrow Q) \vdash P$

   (g) $S \longrightarrow C, A \longrightarrow \neg C \vdash S \longrightarrow \neg A$

   (h) $\vdash (A \longrightarrow B) \longrightarrow (A \longrightarrow (A \longrightarrow B))$

2. There is an island in Pacific called the Island of Knights and Knaves. There are two groups of inhabitants on this island, namely Knights who always tell the truth and Knaves who always lie. Can you solve the following puzzle:

   We have three people A, B, and C on the Island of Knights and Knaves. Suppose A and B say the following:

   A: All of us are knaves.

   B: Exactly one of us is a knave.

   Can it be determined what B is? Can it be determined what C is?.

3. On the Island of Knights and Knaves, three inhabitants A, B, C are being interviewed. A and B make the following statements:

   A : B is a knight.
   B: If A is a knight so is C.

   Can it be determined what any of A, B, C are?