1. (Lecture1 PPT) Check whether the following sentences are propositions. For every sentence
which is a proposition, judge whether they are true or false. Please give reasons for your
answers.

- $5 + 7 \leq 10$
- "Is Beijing the capital of China?"
- $x + 3 = 7$
- $x + 1 > x$ for any real number $x$
- For all real numbers $x$, there is a real number $y$ such that $x \cdot y = 1$
- If $5 + 7 > 10$, then $5 > 10$

2. (P13, Ex.11, [R]) Let $p$ and $q$ be the propositions:

$p$: It is below freezing.
$q$: It is snowing.

Write these propositions using $p$ and $q$ and logical connectives (including negations).

- It is below freezing and snowing.
- It is below freezing but not snowing.
- It is not below freezing and it is not snowing.
- It is either snowing or below freezing (or both).
- If it is below freezing, it is also snowing.
- Either it is below freezing or it is snowing, but it is not snowing if it is below freezing.
- That it is below freezing is necessary and sufficient for it to be snowing.

3. (P15, Ex.32, [R]) Construct a truth table for each of these compound propositions

a) $p \rightarrow \neg p$

b) $p \leftrightarrow \neg p$

c) $p \oplus (p \lor q)$

d) $(p \land q) \rightarrow (p \lor q)$

e) $(q \rightarrow \neg p) \leftrightarrow (p \leftrightarrow q)$

f) $(p \leftrightarrow q) \oplus (p \rightarrow \neg q)$

4. (P15, Ex.38, [R]) Construct a truth table for ($(p \rightarrow q) \rightarrow r) \rightarrow s$