1. Finish reading Section 1.5 in van Dalen. Then read Sections 1.6, 2.1, and 2.2. Note that the midterm exam is in class on Wednesday, October 17.

2. Do problem 3 on page 39 of van Dalen.

3. Do problem 4 on page 39. Hints: For 4a, remember that if $\alpha$ and $\beta$ are any formulas, from $\beta$ you can conclude $\alpha \rightarrow \beta$. 4b is tricky, because it is not classically valid; you will need to use RAA. Note that from $\neg \alpha$ you can conclude $\alpha \rightarrow \beta$ using *ex falso* (show how).


5. Do problem 1 on page 47. If you claim the set is inconsistent, show that you can prove a contradiction from those assumptions. If you claim the set is consistent, demonstrate this by providing a valuation under which all the formulas are true. (Note that the completeness theorem implies that if a set of formulas is consistent, there will always be such a valuation.)

6. Do problem 2 on page 47.

7. Do problem 3 on page 47.

8. A formula $\varphi$ is said to be independent of a set of formulas $\Gamma$ if $\Gamma \not\vdash \varphi$ and $\Gamma \not\vdash \neg \varphi$. Suppose $\Gamma$ is a consistent set of formulas, $\varphi$ is independent of $\Gamma$, and $\psi$ is independent of $\Gamma \cup \{ \varphi \}$. Show that there are at least three different maximally consistent sets containing $\Gamma$.

9. Find a consistent set $\Gamma$ that is not maximally consistent, but has the property that there is only one maximally consistent set containing it. In fact, show that there is a fixed natural number $k$, such that we can assume that every formula in $\Gamma$ has length at most $k$.


11. Do problem 5 on page 48. In effect, you will be describing a computer program that prints out propositional formulas ad infinitum, in such a way that every propositional formula is printed sooner or later.
12. Do problem 6 on page 48. Van Dalen’s wording is awkward. What you need to prove is this: Suppose $\Gamma$ is a consistent set of formulas with the property that for every formula $\varphi$, either $\varphi \in \Gamma$ or $\neg \varphi \in \Gamma$. Then $\Gamma$ is maximally consistent.

13. Show that if $\Gamma$ is any consistent set, and $\varphi$ is any formula, then either $\Gamma \cup \{\varphi\}$ or $\Gamma \cup \{\neg \varphi\}$ is consistent. (Hint: suppose they are both inconsistent...)