HOMEWORK 5
Due Thursday, October 4

1. Show $\vdash (\varphi \vee \psi) \leftrightarrow (\neg\varphi \to \psi)$.

2. Do problem 11 on page 38 of van Dalen.

3. Show that the system of natural deduction is *free from contradiction*, in the sense that there is no propositional formula φ for which one has both $\vdash \varphi$ and $\vdash \neg\varphi$. (Hint: use soundness.)

4. In section 2.5 of van Dalen, do problem 1 (pp. 44-5).
   Hint: If you claim the set is inconsistent, show it by deriving a contradiction from those assumptions. If you claim the set is consistent, show this by providing a valuation under which all the formulas are true (and reason from soundness that a set of formulas is consistent if there is such a valuation).

⋆ 5. Extend the proof of soundness, Lemma 2.5.1 in van Dalen, to cover the full language of propositional logic, by proving that the $\vee I$ and $\vee E$ rules are sound.