**MATH454 HOMEWORK 2**
**DUE THURSDAY, SEPTEMBER 12**

*Exercise* 1. Do Exercise 2.4 from the textbook.

*Exercise* 2. Do Exercise 2.6 from the textbook.

*Exercise* 3. Do Exercise 2.9 from the textbook.

*Exercise* 4. Do Exercise 2.10 from the textbook.

*Exercise* 5 (Reach). Do Exercise 2.13 from the textbook. (See pages 18–19 for the necessary definitions.)

*Exercise* 6. Do Exercise 3.1 from the textbook.

Let $R$ be a binary relation on a set $A$. Say that $R$ is *well-founded* if for any nonempty $X \subseteq A$ there is $x \in X$ so that there is no $y \in X$ so that $y \, R \, x$.

*Exercise* 7. Prove that a (strict) total order $(L, <)$ is a well-order if and only if $<$ is well-founded.

*Exercise* 8. Give two different examples of well-founded relations which are not total orders. (Drawing a picture is a perfectly acceptable way to give an example.)

*Exercise* 9. Let $A$ be a set and let $E$ be the relation on $A$ defined as: for $x, y \in A$, $(x, y) \in E$ if $x \in y$. Show that $E$ is well-founded. (Hint: use the Foundation axiom.)