

**CS 2022/ MA 2201 Discrete Mathematics**  
**A term 2011**

**Practice Final Exam**

These problems are sample problems for the final exam, so you may expect similar problems in the final. Do not hand in your solutions. Solutions will be handed out, discussed (and posted on the web) on Tuesday. The final exam is from the material of the whole course, but there will be only one or two problems from the first half. The final exam is a closed book exam, but you may use two sheets of paper (so you may use your midterm sheet) with notes on it. Each problem is worth 20 points.

1. Is  $(\neg q \rightarrow \neg p) \equiv (p \rightarrow q)$ ? Justify your response.
2. Prove by induction that  $\sum_{i=1}^n (2i - 1) = n^2$  for all positive integers  $n$ .
3. The US Senate has 100 members. If the senators consist of 85 men and 15 women, in how many ways can we pick a committee of 10 senators consisting of 5 men and 5 women.
4. Prove or give a counterexample to the following: For a set  $A$  and binary relation  $R$  on  $A$ , if  $R$  is reflexive and symmetric, then  $R$  must be transitive as well.
5. For each of the following , either give an example or prove there are none:
  - (a) A simple graph with 6 vertices, whose degrees are 2, 2, 2, 3, 4, 4.
  - (b) A simple graph with 8 vertices, whose degrees are 0, 1, 2, 3, 4, 5, 6, 7.
  - (c) A simple graph with degrees 1, 2, 2, 3.