## Homework 1

Due Tuesday, September 7 at 10am. Please upload a legible copy to bCourses.

1. Ross, 1.4.

2. Ross, 1.12.

3. Let  $a, b \ge 0$ . Use the ordered field axioms to prove that  $a \le b$  if and only if  $a^2 \le b^2$ .

4. Ross, 4.7.

5. Ross, 4.8.

6. Ross, 4.11.

- 7. a) Prove the following: If r is the supremum of  $S = \{x \in \mathbb{Q} | x^2 \le 2\}$ , then  $r^2 = 2$ . (Hint: Use problem 3, and find contradictions to  $r^2 < 2$  and  $r^2 > 2$ .)
  - b) Conclude that there exists  $r \in \mathbb{R}$  such that  $r^2 = 2$ .
  - c) Conclude that the Completeness Axiom does not hold if we replace  $\mathbb{R}$  with  $\mathbb{Q}$ .