

**Due: Wednesday, August 1, 2012**

*Problem to be turned in : 3.*

1. If  $p \in \mathbb{Q}$  then  $\frac{2p+2}{p+2} \in \mathbb{Q}$ .
2. Show that there does not exist  $p \in \mathbb{Q}$  such that  $p^2 = 12$ .
3. Let  $A = \{p \in \mathbb{Q} : p^2 < 2\}$ . Show that  $A$  is bounded above but does not have a least upper bound.

**Extra Credit:** Define the set of natural numbers  $\mathbb{N}$  (providing an axiomatic construction). Given  $\mathbb{N}$ , define (and construct)  $\mathbb{Q}$ .