MATH 0413 Fall 2011 Written Homework

Unless specified otherwise, the homework is from the Jiri Lebl’s textbook.

Homework 1. Due Friday, Oct. 7. 1.2.2, 1.2.5, 1.2.7, 1.2.9.

Homework 2. First draft due Monday, Nov. 14.

Problem 1. Suppose \( f(x) \) is defined to be 1 if \( x \in \mathbb{Q} \) and 0 if \( x \in \mathbb{R} \setminus \mathbb{Q} \). Prove that \( f \) is discontinuous at all points \( a \in \mathbb{R} \).

Problem 2. Suppose \( g(x) \) is defined to be 0 if \( x \in \mathbb{R} \setminus \mathbb{Q} \) and \( \frac{1}{n} \) if \( x = \frac{m}{n} \) in lowest terms. Prove that
   a) \( g \) is discontinuous at all points \( a \in \mathbb{Q} \).
   b) \( g \) is continuous at all points \( a \in \mathbb{R} \setminus \mathbb{Q} \).