

## MATH 409-08a, Quiz 8

### Guidelines

1. You may not use any instructional aids other than your text and lecture notes.
2. If you choose to work alone, you may not consult anyone except your course instructor; if you are working with a partner (no more than one partner allowed), you may consult no one other than your partner or your course instructor.
3. Answer the questions in the space provided; you may write on both sides of the paper. Put your name (two names when applicable) in the top right corner. You may append additional sheets as needed, but if you do, *staple everything together before submission*. Write neatly and legibly; shoddy presentation may lead to appropriate penalization.

**Due: Monday, March 31st (in class)**

1. (9 marks) Suppose that  $f$  is a function defined in an open interval  $(a, b)$ , and let  $c \in (a, b)$ . Assume that  $f$  is continuous at  $c$ , and that  $f(c) = 3$ . Prove that there is an open interval  $I \subseteq (a, b)$  such that  $f(x) > 7/4$  for every  $x \in I$ .
2. (16 marks) Suppose that  $f : \mathbf{R} \rightarrow \mathbf{R}$ . Prove that the following statements are equivalent:
  - (a)  $f$  is continuous at every real number.
  - (b) For every open set  $G$  ( $G \subseteq \mathbf{R}$ ), the set

$$\mathcal{I}_f(G) := \{x \in \mathbf{R} : f(x) \in G\}$$

is also open.