Name (PRINTED): _____

Student ID #: _____

Section # (or TA's: name and time) _____

CMSC 250 Quiz #14 Wednesday, May 3, 2006

Write all answers legibly in the space provided. The number of points possible for each question is indicated in square brackets – the total number of points on the quiz is 30, and you will have exactly 15 minutes to complete this quiz. You may not use calculators, textbooks or any other aids during this quiz.

1. [10 pnts.] A gardener plants 600 trees to replenish a forest in 13 days. How many trees **must** have been planted in one single day to accomplish this? (He wants to do the minimum amount of work each day, so you are figuring how much he needs to accomplish in one day in order to finish the project.) You must justify your answers in terms of the pigeon hole principle: what is the domain, what is the codomain, what is the function and how does this lead to your answer.

2. [10 pnts.] Give a single total function that fulfills the requirements stated for that one part of the question. The answer can not be an identity function or a constant function. If it is not possible, write the word "IMPOSSIBLE".

   a. $A : Z^+ \to Z$ such that $A$ is one-to-one but not onto.

   b. $B : Z \to Z^+$ such that $B$ is onto but not one-to-one.

   c. $C : Q \to Q$ such that $C$ is both one-to-one and onto.

3. [10 pnts.] Given the function G defined as follows:

$$G : Q \to Q, \;\; G(x) = x + \frac{1x}{2}$$

Determine each of the following by either providing a proof or giving a counter example:

a. Is G one-to-one?

b. Is G onto?

c. Is G a bijection?