CMSC 250 Homework 12 Spring 2006

Due Wed April 26 at the beginning of your discussion section.

You must write the solutions to the problems single-sided on your own lined paper, with all sheets stapled together, and with all answers written in sequential order or you will lose points.

1. For each of the following determine if it is a (a) total function, (b) a partial function (but not a total function) or (c) not a function at all. Then in one English sentence - explain why you answered that way.

   (a) $A = \{1, 2, 3, 4, 5\}, f : A \to A, f = \{(1, 1), (3, 2), (5, 3), (2, 2), (4, 1)\}$

   (b) $A = \{1, 2, 3, 4, 5\}, f : A \to A, f = \{(1, 1), (2, 3), (3, 5), (2, 2), (1, 4)\}$

   (c) $A = \{1, 2, 3, 4, 5\}, f : A \to A, f = \{(1, 1), (2, 2), (3, 3), (1, 1), (2, 2)\}$

   (d) $A = \{1, 2, 3, 4, 5\}, f : A \to A, f = \{(1, 5), (2, 3), (4, 4)\}$

   (e) $A = \{1, 2, 3, 4, 5\}, f : A \to A, f = \{(1, 5), (2, 5), (3, 5), (4, 5), (5, 5)\}$

2. For each of the following, define a total function that maps from the domain indicated to the co-domain indicated. (Note: Z is the integers, Q is the rationals and R is the reals.)

   (a) $f : Z \to Z$

   (b) $g : Z \to Q$

   (c) $h : Q \to R$

   (d) $j : R \to Z$

3. For each of the following, tell if each is a total function, then if it is a total function, tell if you believe it to be one-to-one and if you believe it to be onto. Then a one sentence explanation of why you answered that way.

   (a) $A = \{1, 2, 3, 4, 5\}, f : A \to A, f = \{(1, 5), (2, 1), (3, 4), (4, 2), (5, 3)\}$

   (b) $A = \{1, 2, 3, 4, 5\}, B = \{1, 2\}, f : A \to B,$
   $$f = \{(1, 1), (2, 1), (3, 1), (4, 1), (5, 2)\}$$

   (c) $A = \{1, 2, 3, 4, 5\}, B = \{1, 2, 3, 4, 5, 6\},$
   $$f : A \to B, f = \{(1, 6), (2, 5), (3, 2), (4, 3), (5, 1), (1, 4)\}$$