

Course 2BA1: Michaelmas Term 2006.

Assignment II.

To be handed in by Wednesday 17th January, 2007.

Please include both name and student number on any work handed in.

1. Prove that $A \cap (B \setminus C) = (A \cap B) \setminus (A \cap C)$ for all sets A , B and C .
2. For each of the following relations, determine whether or not that relation is reflexive, symmetric, transitive, anti-symmetric, an equivalence relation, and/or a partial order, giving appropriate reasons for your answers:—
 - (a) the relation Q on the set \mathbb{R} of real numbers, where real numbers x and y satisfy xQy if and only if $y^3 - x^3 - x + y$ is an integer.
 - (b) the relation P on the set \mathbb{Z} of integers, where real numbers x and y satisfy xPy if and only if $y = 3^k x$ for some non-negative integer k .
3. For each of the following functions, determine whether or not that function is injective and/or surjective, and whether or not it has a well-defined inverse, giving appropriate reasons for your answers:—
 - (a) the function $f: [0, 1] \rightarrow [0, 1]$ with $f(x) = 2x - x^2$.
 - (a) the function $g: [0, 2] \rightarrow [0, 1]$ with $g(x) = 2x - x^2$.