Course 2BA1: Michaelmas Term 2003.

Assignment II.

To be handed in by Friday 28th November, 2003.
Please include both name and student number on any work handed in.

1. Prove that $A \setminus (B \setminus C) = (A \setminus B) \cup (A \cap C)$ 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:—

   (i) the relation P on the set $\mathbb{R}$ of real numbers, where real numbers x and y satisfy xPy if and only if $y = xk^2$ for some integer k.

   (ii) the relation Q on the set $\mathbb{R}$ of real numbers, where real numbers x and y satisfy xQy if and only if $y^3 = x^3 - x + y$.

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:—

   (i) the function $f\colon [-1,1] \to [-2,2]$ with $f(x) = x^3 + x$ for all $x \in [-1,1]$.

   (ii) the function $g\colon (-1,1) \to \mathbb{R}$ with $g(x) = \dfrac{1}{1-x^2}$ for all $x \in (-1,1)$.