| 445.255FC | Assignment 2 | Due: 4pm, Wednesday 20 March 2002 |

NB: Please deposit your solutions in the appropriate box **by 4 p.m. on the due date.** Late assignments or assignments placed into incorrect boxes will not be marked. Use a mathematics department cover sheet. These are available from outside the Resource Centre. PLEASE SHOW ALL WORKING. Also if we believe you have COPIED someone else's script or that you have let someone else COPY YOUR SCRIPT, then you will get NO MARKS.

1. Let A and B be sets.

  (a) Prove that $B \setminus (B \setminus A) = A \cap B$.

  (b) Prove the statement
$$\mathcal{P}(A) \cup \mathcal{P}(B) \subseteq \mathcal{P}(A \cup B)$$

  (c) Show that it is not necessarily true that
$$\mathcal{P}(A) \cup \mathcal{P}(B) = \mathcal{P}(A \cup B)$$

2. Indicate whether each of the following relations on the given set is reflexive, symmetric, antisymmetric, or transitive. Explain each answer.

  (a) $A = \{s : s \text{ is a student in MATHS255}\}$. $x\rho y$ iff x is no older than y.

  (b) $B = \{x : x \in \mathbb{Z} \text{ and } x > 0\}$. $\ell\rho m$ iff $\ell + m = 5$.

  (c) $C = \{a, b, c\}$ (distinct elements). $\rho = \{(b, b), (b, c), (c, a), (b, a), (a, b)\}$.

  (d) $D = \{\ell : \ell \text{ is a straight line in the Cartesian plane }\}$. $\ell\rho m$ iff ℓ intersects m.

  (e) $E = \{p : p \text{ is a staff member at the University of Auckland}\}$. $p\rho q$ iff p has shaken hands with q.