The University of Waikato
Department of Mathematics

Topics in Pure Mathematics: Topology, math319-11A Assignment 2s, due Friday 27th May - through the slot outside G3.19.

1. If X **is a set and** $A,\ B$ **subsets show that** $X \setminus A \cup B = (X \setminus A) \cap (X \setminus B)$**.**

2. If $X = \{a, b, c\}$ **and** $\tau = \{\emptyset, \{a, b, c\}, \{b\}, \{a, b\}, \{c, b\}\}$ **show that** τ **is a topology on** X**. Then show it is not Hausdorff.**

3. Show that if $\mathbb{R}$ **has its usual topology (with a base of open intervals) then every open subset can be written as an at most countable union of disjoint open intervals.**

4. If $X = \mathbb{R}^2$ **and we define** $d((x, y), (a, b)) = |x - a| + |y - b|$ **show that** d **is a metric on** X **by verifying** $M1,\ M2,\ M3$**. Then describe the ball** $B((2, 2), 1)$**.**

5. Show that the metric $d(x, y) = |x - y|$ **generates the usual topology on** $\mathbb{R}$**.**

6. Show that in the usual topology $\mathbb{Q}$ **is dense in** $\mathbb{R}$**.**

7. If $A \subset X$ **and** (X, τ) **is a topological space show that** $A^o = A \setminus \partial A$**.**

8. If $f : X \to Y$ **is a function and** $A \subset X$ **show that** $A \subset f^{-1}(f(A))$**.**