Problem 3.1.1

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February 17, 2013

Prove 2 implies 3.

Proof. Assume that for all $a \in U$, there exists $r > 0$ such that $B_r(a) \subset U$. Now, let $x \in U$. Now, we have $r_x > 0$ such that $B_{r_x}(x) \subset U$. Now consider $y \in X$. By the definition of open ball, if $d(x, y) < r_x$, then $x \in B_{r_x}(x) \in U$. \qed