# 4. Yes, $B_r(x) - \{x\}$ is a mfd. The proof is the same as for the HW problem in which we showed $B_r(x)$ is an open set (HW #3, problem 1).

# 5. (a) No: $S^1 \setminus \{(1,0) \sim (-1,0)\}$ looks like \(\bigcirc\setminus\{(1,0),(-1,0)\}\)

The point \(\{(1,0),(-1,0)\}\) has no nbhd that's homeomorphic to $\mathbb{R}^1$ (or any $\mathbb{R}^n$).

(b) Yes; in HW #12 we saw this is homeo to $S^1$.

# 6. Let $X = S^1$, $Y = \mathbb{R}^1$; then $X$ is locally homeo to $Y$ but not vice versa.