MAB298-Elements of Topology: Problem Sheet 6
Homeomorphic or not?

1. Divide the topological spaces indicated below into classes of pairwise homeomorphic spaces:

   - $\mathbb{R}$ with discrete topology
   - $\mathbb{Z}$ with discrete topology
   - $\mathbb{R}$ with indiscrete topology
   - $\mathbb{N}$ as a subset of $\mathbb{R}$ (with the induced topology)
   - $\mathbb{R}$ (standard topology)
   - $\mathbb{R}$ with the topology $\tau = \{\emptyset, \mathbb{R}, (a, +\infty), a \in \mathbb{R}\}$
   - $\mathbb{R}^2$
   - (a, b)
   - $[a, b)$
   - $(a, b]$
   - $[a, b]$
   - open half plane $\{(x, y) \ : \ y > 0\}$
   - closed half plane $\{(x, y) \ : \ y \geq 0\}$
   - open quadrant $\{(x, y) \ : \ x > 0, y > 0\}$
   - closed quadrant $\{(x, y) \ : \ x \geq 0, y \geq 0\}$
   - sphere $\{x^2 + y^2 + z^2 = 1\}$
   - open disc $\{x^2 + y^2 < 1\}$
   - closed disc $\{x^2 + y^2 \leq 1\}$
   - $\{(x, y) \ : \ 0 \leq y < 1\}$
   - $\{(x, y) \ : \ xy = 0\}$
   - annulus $\{1 < x^2 + y^2 < 4\}$
   - punctured plane $\mathbb{R}^2 \setminus \{(0, 0)\}$
   - punctured sphere $\{x^2 + y^2 + z^2 = 1\} \setminus \{(0, 0, 1)\}$
   - $\mathbb{Q}$ as a subset in $\mathbb{R}$