Math 490 Homework #2
due Wednesday, September 12

1: Kinsey, Exercise 2.31 (p. 31)

2: Kinsey, Exercise 2.33 (p. 32)

3: Kinsey, Exercise 2.34 (p. 32)

4: Kinsey, Exercise 3.35 (p. 55)

5: Let $S^2 = \{(x, y, z) \in \mathbb{R}^3 : x^2 + y^2 + z^2 = 1\}$, let $NP = (0, 0, 1)$ be the north pole, let $SP = (0, 0, -1)$ be the south pole. Let $Y = \{(x, y, z) \in \mathbb{R}^3 : x^2 + y^2 = 1\}$ be the infinite cylinder. Show that $X = S^2 \setminus \{NP, SP\}$ and Y are homeomorphic. (Hint: use a variation on stereographic projection. "Proof by picture" is OK.)

6: In each of the following examples, identify the quotient space up to homeomorphism as a subset of some Euclidean space $\mathbb{R}^n$ (picture and/or verbal description is sufficient):

(i) $X = \mathbb{R}$, $x \sim y$ if and only if $x = y$ or $\{x, y\} = \{+1, -1\}$.

(ii) $X = \mathbb{R}^2$, $x \sim y$ if and only if $x = y$ or $\{x, y\} = \{(1, 0), (-1, 0)\}$.

(iii) $X = \mathbb{R}^3$, $x \sim y$ if and only if $x = y$ or $\{x, y\} = \{(1, 0, 0), (-1, 0, 0)\}$.