1. Draw a series of pictures (stages of a deformation) to prove that a punctured torus (a torus with a small open disk removed) is homeomorphic to the surface drawn in part (a) below. Then give an argument to prove that a punctured torus is not homeomorphic to the surface drawn in part (b) below.

(a) (b)

2. (i) Separate the following surfaces into homeomorphic groups. Give arguments or draw pictures to explain why any two surfaces are or are not homeomorphic.

   (ii) Separate the following surfaces into isotopic groups. Give arguments or draw pictures to explain why any two surfaces are or are not isotopic.

(a) (b) (c)

(d) (e) (f)

(g) (h) (i)

3. Prove the following theorem: S^1 cannot be embedded in $\mathbb{R}$.