

Earlier in the course, we endowed the interval  $[0, 1)$  with the quotient topology  $Q$  arising from  $f : \mathbb{R} \rightarrow [0, 1)$  defined by  $f(x) = x - \lfloor x \rfloor$ . In homework we proved that  $[0, 1)_Q$  is homeomorphic to the circle  $\mathbb{S}^1$ . (One can object that we never finished that proof, but let's call it done.)

A. Prove that  $[0, 1)_Q$  is not homeomorphic to  $[0, 1)_{\text{std}}$ . (This exercise is short.)

B. Section 24 Exercise 2. (This exercise is of medium length. Hint: Contradiction.)

By the way, Exercise 2 is a special case of the Borsuk-Ulam theorem, which is related to the Ham Sandwich theorem and other fun stuff that you might encounter later in life. Exercise 3 is of a similar spirit (but I'm not asking you to hand in Exercise 3).

C. Section 24 Exercise 9. (This exercise is of medium length. I hesitated to assign it, because it's not typical of how problems are posed or solved in topology. But a little variety can be refreshing.)