HOMEWORK 23

Note: $*$ marked problems might be slightly more difficult or interesting than the unmarked ones.

(1) Let $h : S^1 \to X$ be a continuous map. Show that if $h_* : \pi_1(S^1) \to \pi_1(X)$ is the trivial homomorphism, then h is null homotopic.

(2) Show the following properties of antipode-preserving maps:
   (i) Composition of two antipode-preserving maps is antipode-preserving.
   (ii) If $h : S^1 \to S^1$ is null homotopic, then $r_\theta \circ h$ is null homotopic for any value of θ.

(3) Topology (Munkres), Chapter 9, Section 54, Exercise (7).

(4) Topology (Munkres), Chapter 9, Section 55, Exercise (1).

(5) Topology (Munkres), Chapter 9, Section 55, Exercise (2).

(6) Topology (Munkres), Chapter 9, Section 55, Exercise (4).

(7) Topology (Munkres), Chapter 9, Section 57, Exercise (2).

(8) Topology (Munkres), Chapter 9, Section 57, Exercise (4).