Book exercises, pages 52-54: #2, 3, 4, 8, 9, 10, 17.

Two additional problems:

A1. Show that if two maps \( f, g : (X, x_0) \rightarrow (S^1, s_0) \) are homotopic just as maps \( X \rightarrow S^1 \) without regard to basepoints, then they are homotopic through basepoint-preserving maps via a homotopy \( f_t : (X, x_0) \rightarrow (S^1, s_0) \). [Hint: Use rotations of \( S^1 \).]

A2. Let \( X \) be a disk, annulus, or Moebius band, including the boundary circle or circles, which we denote \( \partial X \).

(a) For each point \( x \) in \( X \), show that the inclusion map \( X - \{x\} \hookrightarrow X \) induces an isomorphism on \( \pi_1 \) if and only if \( x \) is a point in \( \partial X \).

(b) If \( Y \) is also a disk, annulus, or Moebius band, and if \( f : X \rightarrow Y \) is a homeomorphism, show that \( f \) restricts to a homeomorphism \( \partial X \rightarrow \partial Y \).

(c) Show that the Moebius band is not homeomorphic to an annulus.