

**MATH GU4053: INTRODUCTION TO ALGEBRAIC TOPOLOGY**

**Due: 01/30/20 beginning of class**

- (1) Hatcher Exercise 0.2 (p. 18).
- (2) Hatcher Exercise 0.3 (p. 18).
- (3) Hatcher Exercise 0.16 (p. 18).
- (4) Hatcher Exercise 0.17 (p. 18).
- (5) Hatcher Exercise 0.19 (p. 18).
- (6) Hatcher Exercise 1.1.12 (p. 39).
- (7) For a subspace  $A \subset X$ , a map  $r : X \rightarrow A$  is called a retract if  $r(X) = A$  and  $r|_A = Id_A$ .
  - a) Show that if  $i : A \hookrightarrow X$  is the inclusion of a subspace  $A \subset X$  and  $r : X \rightarrow A$  is a retract, then the induced map  $i_* : \pi_1(A) \rightarrow \pi_1(X)$  is injective and  $r_* : \pi_1(X) \rightarrow \pi_1(A)$  is surjective.
  - b) Hatcher Exercise 1.1.16 (p. 39).
- (8) Hatcher Exercise 1.1.18 (p. 39).