

Course 1213 - Introduction to group theory 2016

S h e e t 1

Due: at the end of the lecture

Exercise 1

How many maps, injective maps, surjective maps and bijective maps f from A to B exist for

- (i) $A = \{1\}, B = \{1, 2\}$;
- (ii) $A = \{1, 2\}, B = \{1\}$;
- (iii) $A = \{1, 2\}, B = \{1, 2\}$;
- (iv) $A = \{1, 2, 3\}, B = \{1, 2\}$.

Exercise 2

Find the inverse map f^{-1} and specify its source and target for

- (i) $f(x) = -2x$;
- (ii) $f(x) = 3 - x$;
- (iii) $f(x) = e^{2x} - 1$.

Exercise 3

Let $f: S \rightarrow T$ be a map and $A, B \subset S$ be two subsets.

- (i) Show that $f(A \cup B) = f(A) \cup f(B)$;
- (ii) Show that $f^{-1}(A \cup B) = f^{-1}(A) \cup f^{-1}(B)$;
- (iii) Show that $f(A \setminus B) \supset f(A) \setminus f(B)$ and illustrate by example that “ \supset ” cannot be replaced by “ $=$ ” in general.