

MAU11602 Assignment 8
Due 2026-04-02

1. A subset A of a set B is said to be cofinite if $B \setminus A$ is finite. Note that unlike finiteness, cofiniteness is a relative notion. In other words, if A is a subset of B and also a subset of C then it's a finite subset of B if and only if it's a finite subset of C , but it could well be a cofinite subset of B while not being a cofinite subset of C or vice versa.
 - (a) Show that every subset of a finite set is cofinite.
 - (b) Show that the set of cofinite subsets of a finite set is finite.
 - (c) Show that the union of two cofinite subsets of a set is a cofinite subset.
 - (d) Show that the intersection of two cofinite subsets of a set is a cofinite subset.
 - (e) Show that the union of a finite subset and a cofinite subset is cofinite.
 - (f) Show that the intersection of a finite subset and a cofinite subset is a finite subset.
 - (g) Show that no subset of an infinite set is both finite and cofinite.
2. Suppose f is a function from a finite set A to A . It was stated, but not proved, in lecture that if f is injective then it is surjective. Prove this. I would recommend proving them using set induction but if you want to use the definition of finiteness directly that's also okay.

If you do the argument in the most straightforward way there is a certain amount of case by case analysis needed so don't be surprised if your answer is long.