PROBLEM SET 2 (DUE ON SEP 28)

(All Exercises are references to *Introduction to Commutative Algebra* by M. Atiyah and I. Macdonald.)

Problem 1. Chapter 1, Exercise 7 (conditions under which every prime ideal is maximal)

Problem 2. Chapter 1, Exercise 10 (equivalent conditions to a ring having exactly one prime ideal)

Problem 3. Chapter 2, Exercise 3 (conditions under which $M \otimes N = 0 \implies M = 0$ or $N = 0$)

Problem 4. Chapter 3, Exercise 1 (when is $S^{-1}M = 0$ for M finitely generated?)

Problem 5. Chapter 3, Exercise 2 (another form of Nakayama's Lemma)

Problem 6. Chapter 3, Exercise 13 (being torsion-free is a local property)

Problem 7. Let A be a ring. Let n be a positive integer. Show that any surjective A-module homomorphism $A^n \to A^n$ is an isomorphism. (This is a restatement of Chapter 3, Exercise 15, which contains a proof sketch. You may assume Chapter 2, Exercise 12 when proving this.)