COS 423	Theory of Algorithms	Spring 2018

Precept 11

These problems will be solved in precept.

1. Consider the following two problems:

   - SUBSET-SUM: Given n natural numbers $w_1, \ldots, w_n$ and an integer W, is there a subset that adds up to exactly W? The subset may contain each number at most once.
   - PARTITION: Given m natural numbers $v_1, \ldots, v_m$, can they be partitioned into two subsets that add up to the exact same value?

   (a) Prove that SUBSET-SUM $\leq_P$ PARTITION.

   (b) Prove that PARTITION is **NP**-complete.

2. Prove that SAT $\leq_P$ 3-SAT. To do so, deal with each of these cases separately:

   (a) SAT clause contains two (or more) occurrences of the same literal.

   (b) SAT clause contains both a literal and its negation.

   (c) SAT clause contains no literals (e.g., after dealing with previous two cases).

   (d) SAT clause contains exactly 3 literals.

   (e) SAT clause contains exactly 2 literals.

   (f) SAT clause contains exactly 1 literal.

   (g) SAT clause contains 4 or more literals.