

Assignment 1

CS 311, Fall 2015
Due October 5, 2015

Problem 1 Prove by induction on n :

$$\forall a \geq 2, \sum_{i=0}^n a^i = \frac{a^{n+1} - 1}{a - 1}$$

Problem 2 Use the *pigeonhole principle* to prove the following: Every undirected simple graph with at least 2 nodes has two nodes with the same degree.

Problem 3 Let $S = \{a, b, c, d, e, f\}$, find the number of subsets of S which include the elements a or b .

Problem 4 Given two natural numbers x and y such that $x > y$, prove that:

$$x \bmod y < \frac{x}{2}$$