

CS200 - Problem Set 6

Due: Monday, Oct. 30 to submission server before class

Please read the sections of the syllabus on problem sets and honor code before starting this homework.

1. [11 points] Prove true or prove false: $2^{2^n} = O(2^n)$.
2. [11 points] Let $a_0, a_1, a_2, \dots, a_m \in \mathbb{N}$. Consider the function $f : \mathbb{N} \rightarrow \mathbb{N}$ where

$$f(x) = \sum_{i=0}^m a_i x^i = a_0 + a_1 x + a_2 x^2 + \dots + a_m x^m. \quad (1)$$

Prove that $f(x) = O(x^m)$.

3. [6 points] Explain how you could use a graph to represent e-mail messages sent between employees at a company. What should the vertices and edges represent? Should edges be directed or not directed? Should there be self-loops in the graph (edges from one vertex back to itself)? Should there be multiple edges allowed between two vertices?
4. Consider a graph on the vertices $\{a, b, c, d, e, f\}$ such that each vertex is connected to exactly one other vertex by an edge.
 - (a) [6 points] Suppose you would like to create an undirected graph on the vertices. How many possible graphs are there that satisfy this condition?
 - (b) [6 points] If the graph is directed, how does your answer change?
5. How many bit strings of length 10 have
 - (a) [6 points] exactly three 0s?
 - (b) [6 points] more 0s than 1s?
 - (c) [6 points] at least seven 1s?
 - (d) [6 points] at least three 1s?
6. How long did you spend on this homework?