CS255, Spring 2014, SJSU
Homework 1

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Problem 1

Suppose you have 2 algorithms, A and B, for solving a given problem. The running time of algorithm A for solving a problem of size n is $100n^2$. The running time of algorithm B for solving a problem of the same size is 2^n. What's the minimum value of n for which algorithm A is faster than algorithm B?

Problem 2

Rank the following functions by order of growth, from lowest to highest.

- $(\sqrt{5})^n$
- $\lg n$
- $4^{\lg n}$
- $n^3 - n$
- $n!/1000$
- $n \lg n$

Problem 3

Exercise 3.1-1, page 52 from textbook.

Problem 4

Exercise 3.1-2, page 52 from textbook.

Problem 5

Exercise 3.1-3, page 53 from textbook.

Problem 6

Exercise 3.1-4, page 53 from textbook.

Problem 7

Let $f(n)$ and $g(n)$ be non-negative functions. Prove that $f(n) = \mathrm{O}(g(n))$ implies $g(n) = \Omega(f(n))$.

Problem 8

Use mathematical induction to prove that:

$$\sum_{i=0}^{n-1} ar^i = \frac{ar^n - a}{r - 1}, \text{ with } r \neq 1.$$

Problem 9

Exercise 4.3-1, page 87 from textbook. (Using the substitution method.)

Problem 10

Exercise 4.3-2, page 87 from textbook. (Using the substitution method.)