# Computer Science Notes

*Spring 2024*

Zach Leach

Draft February 5, 2024

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*The University of Texas at Dallas*

# Contents

# Preface

These are my exam review notes taken throughout the Spring semester.

February 5, 2024
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# Part I

# Computer Networks

# Exam 1

# Part II

# Advanced Algorithms

# Exam 1

# Assignment 1

# Assignment 2

3.1 Are either $\lceil \lg n \rceil !$ or $\lceil \lg \lg n \rceil !$ polynomially bounded?

Polynomially bounded means

3.2 Use induction to prove $F_i = \frac{\phi^i - \hat{\phi}^i}{\sqrt{5}}$; where $F_i = F_{i-2} + F_{i-1}$, and $\phi$ is the golden ratio $\frac{1+\sqrt{5}}{2}$.

3.3 Show that $k \lg k = \Theta(n)$ implies $k = \Theta\left(\frac{n}{n \ln n}\right)$.

3.4 Are either $2^{n+1}$ or $2^{2n}$ big-$O$ of $2^n$?

3.5 For each pair of functions $(A, B)$, indicate whether $A$ is $O, o, \Omega, \omega$, or $\Theta$ of $B$. Assume $k \geq 1$, $\epsilon > 0$, $c > 1$ are constants.

| $A$ | $B$ | $O$ | $o$ | $\Omega$ | $\omega$ | $\Theta$ |
|---|---|---|---|---|---|---|
| test1 | test2 | a | b | c | | |

3.6 Order the following functions such that $f_1 = \Omega(f_2), f_2 = \Omega(f_3), \ldots, f_{29} = \Omega(f_{30})$, and partition them into equivalence classes such that each function is big-$\Theta$ of each other.

# Part III

# Software Engineering

# Exam 1

# Part IV

# Operating Systems

# Exam 1