University of Nevada, Las Vegas Computer Science 477/677 Fall 2022

I expect you to remember some meterial from the prerequisite courses.

You have surely seen some examples of asymptotic notation, such as "big O." I will introduce Ω and Θ notation.
In asymptotic analysis, multiplicaion by a positive constant is irrelevant, as is addition of a constant.
Any logarthmic function grows more slowly than any polynomial function.
The asymptotic class of a logarithmic function does not depend on the base. For example: $\log_2 n = \Theta(\ln n) = \Theta(\log_{10} n) = \Theta(\log_{100} n)$
Any algebraic polynomial function, such as $3 - 4n + 5n^2 - n^3$ is in the polynomial class, otherwise known as $\mathcal{P}$.
However, There are functions in $\mathcal{P}$ that are not algebraic polynomials, such as $3n \log n + \sqrt{n}$ and $n + \log n + 5$, both of which are $\Theta(n)$.
Remember that $\log(n!) = \Theta(n \log n)$. This is one of the most important relations in computer science, and arises frequently on graduate examinatrions.

Topics in 477/677 will include:

- O, Ω, and Θ, and what they mean.
- Recurrences.
- Time complexity of code.
- Dynamic programming.
- Divide and conquer.
  - Mergesort.
  - Quicksort.
  - Binary search.
- Greedy algorithms.
  - Huffman's.
  - Kruskal's.
- Sorting algorithms.
- Data stuctures.
  - Priority queue.
    - Stack.
    - Queue.
    - Heap.
  - Search structures.
    - Unordered list and linear search.
    - Binary search tree.
    - Hash table.
    - Collision resolution.
- Array and linked list implementations of data structures.
- Sparse arrays and memoization.
- Loop invariants.
- FFT (Fast Fourier Transform).