1. Rank the following functions by order of growth; that is, find an arrangement \( g_1, g_2, \ldots, g_{25} \) of the functions satisfying \( g_1 = \Omega(g_2), \ g_2 = \Omega(g_3), \ldots, g_{24} = \Omega(g_{25}) \). Partition your list into equivalence classes such that \( f(n) \) and \( g(n) \) are in the same class iff \( f(n) = \Theta(g(n)) \).

\[
\begin{array}{c}
(3/2)^n & (\sqrt{2})^{\log n} & \log^* n & n^2 & (\log n)! \\
n^3 & \log^2 n & \log(n!) & 2^2^n & n^{1/\log n} \\
\log \log n & n \cdot 2^n & n^{\log \log n} & \ln n & 2^n \\
2^{\log n} & (\log n)^{\log n} & 4^{\log n} & (n+1)! & \sqrt{\log n} \\
n! & 2^{\sqrt{2 \log n}} & n & n \log n & 1
\end{array}
\]

2. Argue informally that the quicksort routine presented in the book will run in time \( \Theta(n \log n) \) when all elements in the array are equal.

3. CLR 2.1.4

4. A sorting algorithm is described as stable if equal elements are in the same relative order in the sorted sequence as in the unsorted sequence. Which of insertion sort, quicksort, and mergesort are stable? Give a simple fix to make the unstable sorts stable.

5. CLR 4-1 a-f

6. CLR 7-2 a-d