Exercise 6.1 - Dynamic Tables

Suppose that instead of contracting a table by halving its size when its load factor drops below 1/4, we contract it by multiplying its size by 2/3 when its load factor drops below 1/3. Using the potential function

\[ \phi(T) = |2 \cdot \text{num} - \text{size}| \]

show that the amortized cost of a Table-Delete that uses this strategy is bounded by a constant.

Exercise 6.2 - Dynamic Tables

Consider the potential function from the lecture, chapter 9, page 14. Now, check:

\[ \sum a_i \geq \sum t_i \]

Exercise 6.3 - Randomized Quicksort

Show that

\[ \sum_{k=2}^{n-1} k \log k \leq \frac{1}{2} n^2 \log n - \frac{1}{8} n^2 \]

Hint: Split the summation into two parts, one for \( k = 2, 3, \ldots, \lfloor n/2 \rfloor - 1 \) and one for \( k = \lfloor n/2 \rfloor, \ldots, n - 1 \).