1. Prove that $A_3(j) \geq \text{tower}(j)$, where
\[
\text{tower}(n) = \begin{cases} 
2^{\text{tower}(n-1)} & \text{if } n > 0, \\
1 & \text{if } n = 0.
\end{cases}
\]

2. Binomial heaps were discussed in the lecture of March 19, where algorithms for \textsc{Binomial-Heap-Extract-Min}, \textsc{Binomial-Heap-Decrease-Key}, and \textsc{Binomial-Heap-Delete} were described in vague terms. Write these algorithms out in detail and give inputs that cause them (each) to run in $\Omega(\log n)$ time.

3. Problem 19-3 on page 529