1. Recall the “Master Method” theorem from lecture:

Given a recurrence $T(n) = aT(n/b) + O(n^d)$ with $a \geq 1$, and $b > 1$, and $T(1) = \Theta(1)$, then

$$T(n) = \begin{cases} 
O(n^d \log n) & \text{if } a = b^d \\
O(n^d) & \text{if } a < b^d \\
O(n \log n) & \text{if } a > b^d
\end{cases}$$

Describe the intuition for the three cases, and the intuitive interpretation of the corresponding bounds on $T(n)$ for those three cases.

2. Find a runtime bound for $T(n) = 3T(n/2) + O(n^2)$, with $T(1) = 1$.

3. Find a runtime bound for $T(n) = T(n-1) + O(1/n)$, with $T(1) = 1$.

4. Our select algorithm from class divided the $n$-length array into $\frac{n}{5}$ lists of 5. Analyze the runtime of select if we instead divided the $n$-length array into $\frac{n}{7}$ lists of 7.