Assignment #2:
Due February 4

1. **Exercises** 4.3-6, 4.3-9

2. Consider the recurrence relation:

\[
\begin{align*}
t(n) &= t\left(\frac{n}{3}\right) + t\left(\frac{2n}{3}\right) + n \\
t(1) &= \Theta(1)
\end{align*}
\]

(a) Using recursion tree, show that \( t(n) = \Omega(n \lg n) \)

(b) Using substitution method show that \( t(n) = O(n \lg n) \)

3. **Problem** 4-4

4. **Problem** 4-3: (b), (c), and (f)

5. (Challenge Problem: Consider Case 3 of master theorem: (i) \( f(n) = \Omega(n^{\log_b a + \epsilon}) \) for some \( \epsilon > 0 \); and (ii) \( a f\left(\frac{n}{b}\right) \leq c f(n) \) for some \( c < 1 \) for \( n \) sufficiently large. Do we need both of these conditions or is one stronger than the other?)