1. Let $\mathcal{A}$ be the second NBA in Example 4.37 (i.e., the NBA in the upper right of Figure 4.13) and $\mathcal{A}'$ be the NBA in Figure 4.17 of the text.

   (a) Using the method from class, give a GNBA for $L_\omega(\mathcal{A}) \cap L_\omega(\mathcal{A}')$.

   (b) Using the method from class, convert the GNBA from Part (a) into an equivalent NBA.

2. Prove that if $L_1$ and $L_2$ are $\omega$-languages that can be recognized by DBAs, then $L_1 \cap L_2$ can also be recognized by a DBA. (In other words, prove that the languages recognizable by DBAs are closed under intersection.)

   [Hint: We have a two step method that transforms two NBAs $\mathcal{A}_1$ and $\mathcal{A}_2$ into an NBA $\mathcal{A}$ for $L_\omega(\mathcal{A}_1) \cap L_\omega(\mathcal{A}_2)$. (You applied this method in the previous problem.) You have to show that if $\mathcal{A}_1$ and $\mathcal{A}_2$ are DBAs, then $\mathcal{A}$ is also a DBA.]

3. Let $AP = \{a, b\}$ and let $E$ be the LT property given in Problem 4 of Homework 3.

   (a) Give an NBA $\mathcal{A}$ such that $L_\omega(\mathcal{A}) = (2^{AP}) \setminus E$.

   (b) For each of the following three transition systems $TS_i$ for $i = 1, 2, 3$,

   construct the reachable part of product $TS_i \otimes \mathcal{A}$. 

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**Due Date: October 26**
(c) For each transition system $TS_i$ use the product you constructed in the previous part to determine if the transition system satisfies the LT property $E$. You do not have to use the double depth first search algorithm. Just use the diagram of the product to explain your answer.