CMSC 652 MIDTERM REVIEW

This is a set of problems you should do to prepare for the midterm. I will not be collecting it.

1. Show there exists a dumbass decidable set that is NOT in NP.

2. Show there exists a non-dumbass decidable set that is NOT in NP.

3. What happens if $\Sigma_2^p = \Pi_2^p$? Prove it.

4. Recall that QBF is the set of true quantified Boolean Formulas. Let S be a sparse set.

    (a) Show that, for all k, if $QBF \leq_{k-tt} S$ then $QBF \in P$ using the interval method.

    (b) Show that, for all k, if $QBF \leq_{k-tt} S$ then $QBF \in P$ using the chain method.

5. Construct an oracle A such that $NP^A - DTIME^A(2^n) \neq \emptyset$.

6. Construct an oracle A such that $DTIME^A(2^n) - NP^A \neq \emptyset$.