CS 720, Fall 2016
Homework 9

Due Date: November 19

1. Baier and Katoen, Exercise 6.1.
(You are asked to give all states where the formulas are true, not just determine if the formula is true in the initial state.)

2. Baier and Katoen, Exercise 6.4, Parts e.g.h.k.o.
(If you determine that a pair of formulas is not equivalent, give a particular choice of Φ and Ψ and a particular transition system that shows that the two formulas are not equivalent. If you determine that a pair is equivalent, you do not need to justify your answer.)

3. Let Φ be the following formula:

$$\neg\forall(\neg(a \wedge b)\mathbf{U}\neg\forall \bigcirc c)$$

   (a) Put Φ into ENF.

   (b) Put Φ into PNF.

4. **Extra Credit:** In class we defined a Hamilton path for a directed graph G to be a path $\langle v_1, \ldots, v_n \rangle$ of G such that every vertex appears exactly once. If the Hamilton path satisfies the additional property that there is an edge from v_n to v_1, then the path is called a Hamilton cycle. The Hamilton cycle (HC) problem is: Given a directed graph G, does G have a Hamilton cycle.

   Give a polynomial time reduction of HC to $\exists - LTL - MC$, i.e., show how in polynomial time you can transform a directed graph G into a transition system $\mathcal{T}$ and an LTL-formula φ such that G has a Hamilton cycle if and only if there is a path π of $\mathcal{T}$ such that $\pi \models \varphi$.