

Homework 4

Phylogenetics

Due date: Thu., 14/11/2013

1. (1 point) Calculate the probability of a rooted caterpillar and balanced phylogenetic tree on four leaves under the Yule model.
2. (3 points) In the PDA model, each element of $B(X)$ is selected with equal probability $1/|B(X)| = 1/(2|X|-3)!!$. Select with uniform probability (i.e. $1/2$) one of the two pendant subtrees rooted at the root of a tree in $B(X)$. What is the probability that the subtree has exactly i leaves?
3. (3 points) Assume now that the trees in $B(X)$ are generated under the Yule model. Prove that the probability that the subtree chosen as in the preceding question has exactly i leaves is $1/(n-1)$.
4. (3 points) What is the probability that a rooted binary tree generated under the PDA model has a given shape?