Universität Greifswald
Institute für Mathematik and Informatik
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# 9. Exercise "Bioinformatics", SS 17

**Aufgabe 1:** (3+2+5=10 Credits)
Given ordered forests $F_1$, $F_2$ and $F_3$. Let $M_1$ be an ordered edit map from $F_1$ to $F_2$ and $M_2$ be an ordered edit map from $F_2$ to $F_3$. Prove:

(a) $M_1 \circ M_2$ is an ordered edit map from from $F_1$ to $F_3$

(b) $\gamma(M_1 \circ M_2) \leq \gamma(M_1) + \gamma(M_2)$

Let $v_i$ be the the root of the right-most tree in $F_i$, $i = 1, 2$. Prove:

(c) If $v_1$ and $v_2$ have both "partners" w.r.t. to an optimal map $M_1$, i.e., $(v_1, h), (k, v_2) \in M_1$, then $k = v_1, h = v_2$ and hence, $(v_1, v_2) \in M_1$.

**Aufgabe 2:** (2+8=10 Credits)
Given the secondary structures $S_1 =$ `(....)(.)` and $S_2 =$ `((..))(.)`

(a) Give the tree representation $T_1$, resp., $T_2$ of $S_1$, resp., $S_2$ together with preordered labeled vertices.

(b) Determine the tree edit distance of these trees (use the edit costs for RNA-trees as given in the lecture). Give the determined optimal ordered edit map and the respective sequence of edit operations that transform $T_1$ into $T_2$.

**Deadline: Tuesday - June 13, 2017**