Homework for lecture Automata and Formal Languages II		
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Aufgabe 5.1. [**Minimization**] (10 points)

Consider the deterministic tree automaton with $\mathcal{F} = T/2, 0/0, Suc/1, Nil/0, Cons/2$, $Q = \{z, nz, e, ne, t, tz\}$, $Q_f = \{t, tz\}$, and the rules:

$$0 \to z \qquad Suc(z) \to nz \qquad Suc(nz) \to nz$$
$$Nil \to e \qquad Cons(tz, e) \to ne \qquad Cons(t, e) \to ne \qquad Cons(tz, ne) \to ne \qquad Cons(t, ne) \to ne$$
$$T(z, e) \to tz \qquad T(nz, e) \to t \qquad T(z, ne) \to t \qquad T(nz, ne) \to t$$

1. What, intuitively, is the language of this automaton?
2. Complete the tree automaton, without changing its language. Specify the completed automaton.
3. Perform the minimization algorithm. Document, for each iteration, the current relation P, and the reason why you did not include some pair of states into P (or, equivalently, why you split an equivalence class).

Aufgabe 5.2. [**Ground Instances**] (10 points)

1. (TATA Ex. 1.9) Let $t \in T(\mathcal{F}, \mathcal{X})$ be a linear term. Prove that the set of ground instances of t is regular.
2. Does this also hold for non-linear terms? Proof or counterexample.

Note: An instance of a term is obtained by substituting its variables by terms. A ground instance is an instance that contains no variables.