Why

We want to simplify common questions using orderings of a rooted tree.[1]

Definition

A *topological ordering* of a rooted tree is an ordering σ for which $v \prec_\sigma \mathbf{pa}(v)$. If there are n vertices, the root has index n and every other vertex has an index less than its parent.

A *postordering* is a topological ordering in which descendents of a vertex are given consecutive numbers. For the postordering σ, if $\sigma^{-1}(v) = j$ and v has k proper descendents then the proper descendents of v have are numbered consecutively from $j - k$ through $j - 1$. Figure 1 shows an example.

One can generate a postordering by numbering vertices in decreasing sequence (starting at n) in the order they are visited.[2]

Given an ordering, the *first descendent* of v (which we denote $\mathbf{fdesc}(v)$) is the descendent with the lowest index. Given a postordering σ, one can check whether a vertex w is a proper descendent of v, by $\mathbf{fdesc}(v) \preceq_\sigma w \prec_\sigma v$.

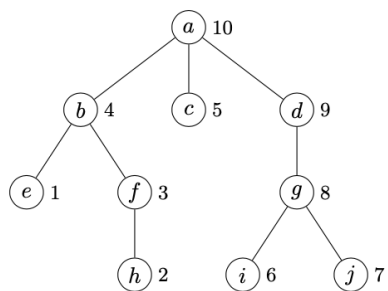[1]This sheet is incomplete and will be updated in future editions.
[2]Future editions will clarify.

Figure 1: A postordering of a rooted tree.

Rooted Tree Orderings

Rooted Trees

Trees

Undirected Paths

Sequences   Undirected Graphs

Direct Products   Set Numbers

Finite Sets

Equivalent Sets

Family Unions and Intersections   Natural Order   Function Inverses

Families   Peano Axioms   Function Composites   Function Images

Natural Induction   Equivalence Relations   Functions

Relations

Generalized Set Dualities   Natural Numbers   Cartesian Products

Intersection of Empty Set   Successor Sets   Set Powers

Set Unions and Intersections   Set Intersections   Set Dualities   Partitions   Unordered Triples

Pair Intersections   Set Complements   Pair Unions

Set Differences   Set Unions   Ordered Pairs

Empty Set   Unordered Pairs

Set Specification

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Identities   Sets

Names

Letters   Objects

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