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Homework 6

A.

1. Define concatenation Concat, and length Length over SEQRosen(E).

Concat:

Basis: Concat(a, nil) = a, \forall a \memberof Set E

Recursion: Concat([e,z],a) = [Concat(z,a), e], where e, z, a are all a \member of Set E.

Length:

Basis: Length(nil) = 0.

Recursion: Length([b[a,nil]]) = Length([a,nil]) + 1, where a, b are \member of Set E.

2. Prove the equivalent of Theorem 1 for your definitions: ”For any E and any w ∈ SEQRosen(E), y ∈ SEQRosen(E), it is the case that Length(Concat(w, y)) = Length(w) + Length(y)”.

Basis: Let y = nil

Length(Concat(w,y)) = Length(w)	Definition of Concat
= Length(w) + 0	
Length(Concat(w,nil) = Length(w) + Length(nil)	Definition of Length

[Assume]: Length(Concat(w, y) = Length(w) + Length(y)

Let y = [e,nil]

Length(Concat(w, [e,nil]) = Length(Concat([w, e], nil))	Definition of Concat
= Length(Concat([w, e]) + 1	Definition of Length
= Length(w) + Length(e) + 1	Ind. Hypothesis
Length(Concat(w, [e,nil]) = Length(w) + Length([e,nil])	Definition of Length

3. Prove the equivalent of Exercise 1 in the handout, concerning CountBs, for SEQRosen(E).

CountB:

Basis: CountB(nil) = false.

Recursion: CountB([e,z]) = (e == b) ? true: false ,where e,z are all a \member of Set E.

B.

Give a recursive definition of the function equals : Σ@ ×Σ @ → {true, f alse} which captures the intuitive meaning of equality between sequences of over of some set Σ.

Basis: equals(nil, v) U equals(v, nil) = true, where (v \member set Σ)

equals(v, w) = true, where (v, w are a \member of set Σ)

Recursion: equals([[[a,nil],a],b], [a,[[nil,a],b]]) = (equals(a,b) /\ equals(a,nil)) ? true: false, where (a,b are a \member of Σ).