Pete Manolios, CSU290 Lecture Notes, Thu Feb 14 2008

Announcements

- Happy Valentine’s Day.
- HWK due on Monday.
- Exam next Thursday.
- No classes on Monday.

Review

Last time: equational proofs in ACL2.

For example, that append is associative.

Today, equational reasoning, part 2

Recall:

```
  (len x)
= (if (endp x)
      0
    (+ 1 (len (cdr x))))
```

Give a proof using =, >= on lhs. So, (len x) = ... >= ... . So, note how important propositional reasoning is.

Let’s prove (len x) >= 0

4. (endp x) => (>= (len x) 0)

5. (consp x) /\ (>= (len (cdr x)) 0) => (>= (len x) 0)

Now, we have the theorem: (len (app x y)) >= (len x)

6. (endp x) => (len (app x y)) >= (len x)

```
7.     (consp x) /\ (len (app (cdr x) y)) >= (len (cdr x))
    => (len (app x y)) >= (len x)
```

And we have the theorem: (len (app x y)) >= (len y)

8. (endp x) => (len (app x y)) >= (len y)

```
9.    (consp x) /\ (len (app (cdr x) y)) >= (len y)
   => (len (app x y)) >= (len y)
```

This brings up an interesting question, which is what theorem do we *really* want? Equality is better than >=, so let’s prove:

(len (app x y)) = ???

(len (app x y)) = (+ (len a) (len b))