

## HW 2 (Released 9/4/24)

1. After defining procedures dec

; pre:  $x$  is an integer  
    (dec  $x$ )

; post: returns  $x - 1$

and inc

; pre:  $x$  is an integer  
    (inc  $x$ )

; post: returns  $x + 1$

Write and prove correct a recursive procedure myAdd of two integer arguments  $x$  and  $y$  which returns the sum  $x + y$ , computed by repeated application of inc and dec. Do not otherwise use  $+$  or  $-$ .

2. Write and prove correct a recursive procedure `sum-digits` which inputs an integer  $x$  and which returns the sum of the digits in  $x$ . Thus

$$(\text{sum-digits } 123) = 6$$

3. Write and prove correct a procedure `myLength` satisfying

;  $l$  is a list

`(myLength  $l$ )`

; returns the length of  $l$

You should of course not use the built-in length function.

4. Write and prove correct a recursive procedure `first-n` which inputs a list  $l$  and an integer  $n$ , and which outputs the list consisting of the first  $n$  elements of  $l$ .

(Be careful to correct this in formal specification, after noting what's wrong with it)

5. Write and prove correct a recursive procedure `myAppend` which inputs two lists  $x$  and  $y$  and which returns the single list formed by concatenating  $x$  and  $y$ . Do not use the built-in procedure `append`. How much time ( $\Theta$ ) does your procedure require?