## Auxiliary Procedures and Context Arguments

Exercise 1.14

**Theorem** *Given the assumption* $0 \leq n < length(v)$, `partial-vector-sum` *computes* $\sum_{i=0}^{i=n} v_i$.

*Proof:* The proof is by induction on $n$. We take $IH(n)$ to be that the procedure `partial-vector-sum` satisfies its contract given that $0 \leq n < length(v)$, where $v$ is a vector.

Where $n = 0$, we have `(partial-vector-sum` $v$ `0)` $= \sum_{i=0}^{i=0} v_0$.

Let $n$ be an integer such that $IH(n-1)$ holds. We need to show that $IH(n-1)$ implies $IH(n)$.

We have that $IH(n-1)$ states that `(partial-vector-sum` $v$ `(-` $n$ `1))` computes $\sum_{i=0}^{i=n-1} v_i$. When we add $v_n$ to this summation, we get

$$\sum_{i=0}^{i=n-1} v_i + v_n = \sum_{i=0}^{i=n} v_i,$$

which is $IH(n)$. This completes of the proof of the claim that $IH(n)$ holds and therefore completes the induction. □