1 Vectors

1.1 Array-based implementation

THEOREM: Additive reallocation takes $O(n^2)$ time, where n is number of elements added.

⟨1⟩1. We copy each element of the array on each INSERT

PROOF:On each INSERT operation we grow our vector, so we copy the whole array, element by element. □

⟨1⟩2. On average, length of the array at the time of INSERT operation is $\frac{n+1}{2} + k$, where k is length the vector had before we had our way with it.

PROOF:For each $i \leftarrow [1..n]$, we copy $k+i$ elements on $i-1$st INSERT operation. If we pair them up as $(i, n-i)$, we get $n+1$ elements copied per each of n pairs. □

⟨1⟩3. Q.E.D.

⟨0⟩1. Q.E.D.