

**In-Class Exercise 1: Bounding a Sequence**

Suppose that a sequence  $\{x_n\}_{n \geq 1}$  with  $x_1 > 0$  satisfies

$$x_n = \sqrt{n} + 2 \sum_{i=1}^{n-1} x_i$$

for  $n \geq 2$ .

Prove or disprove:  $x_n = \mathcal{O}(2^n)$ .

**In-Class Exercise 2: Random Permutations**

For a permutation  $\pi$  on the keys  $\{1..n\}$ , let  $T_\pi$  be the search tree that we obtain from inserting all  $n$  keys, one after the other, in the order given by  $\pi$ .

Prove: If  $\pi$  is drawn uniformly at random, then  $T_\pi$  has the same distribution as  $\tilde{\mathcal{B}}_{[n]}$  from the lecture.