CS:1010 DISCRETE STRUCTURES

PRACTICE QUESTIONS
LECTURE 5

Instructions

- Try these questions before class. Do not submit!

(1) Suppose that the number of bacteria in a colony triples every hour.
   (a) Set up a recurrence relation for the number of bacteria after n hours have elapsed.
   (b) If 100 bacteria is used to begin a new colony how many bacteria will be in the colony in 10 hours?

(2) S.T. $\sum_{j=1}^{n}(a_j - a_{j-1}) = a_n - a_0$, where $a_0, a_1, \ldots, a_n$ is a sequence of real numbers. This type of sum is called telescoping. (Possible write up topic. Search for creative telescoping and you will see papers and expository notes and you can write about them.)

(3) Use the above technique along with the formula $\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$ to derive the formula $\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$.

(4) S.T. $(0, 1)$ and $[0, 1]$ have the same cardinality.

(5) S.T. $(0, 1)$ and $\mathbb{R}$ have the same cardinality.

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