CS2351
Data Structures

Classwork for Lecture 2

Exercise on Θ notation

Show the following bound:

1. $\sum_{k=1 \text{ to } n} k = 1+2+3+\ldots+n = \Theta(n^2)$

Exercise on Θ notation

Show the following bound:

2. $\sum_{k=1 \text{ to } n} k^2 = 1+4+9+\ldots+n^2 = \Theta(n^3)$

Exercise on Θ notation

Show the following bound:

3. $\sum_{k=1 \text{ to } n} (1/k) = 1+(1/2)+\ldots+(1/n) = \Theta(\log n)$

More Exercises

4. For $|c| < 1$, can you simplify

$$\sum_{k=0 \text{ to } \infty} c^k = 1 + c + c^2 + \ldots \, ?$$

More Exercises

5. For $|c| < 1$, can you show that

$$\sum_{k=1 \text{ to } \infty} kc^k = c + 2c^2 + 3c^3 + \ldots$$

$$= c/(1-c)^2 \ ?$$

More Exercises

6. Can you simplify this summation?

$$\sum_{k=1}^{n} \frac{1}{k(k+1)} = \frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \ldots + \frac{1}{n(n+1)}$$

Challenge

What is the name of this sequence:

1, 1, 2, 3, 5, 8, 13, 21, 34, … ?

(a) Can you write a recursive program finding the n^{th} term? What will be the running time?

(b) Can you write a better program to improve the running time to $O(n)$?

(c) Can you think of an even faster way?