Week 4 Exercises

Help Center

4.9

If $\alpha < \beta$, show that α^N is exponentially small relative to β^N. For $\beta = 1.2$ and $\alpha = 1.1$, find the absolute and relative errors when $\alpha^N + \beta^N$ is approximated by β^N, for $N = 10$ and $N = 100$.

4.71

Show that $P(N) = \sum_{k \geq 0} \frac{(N-k)^k (N-k)!}{N!} = \sqrt{\pi N/2} + O(1)$

5.1

How many bitstrings of length N have no 000?

5.3

Let $\mathcal{U}$ be the set of binary trees with the size of a tree defined to be the total number of nodes (internal plus external), so that the generating function for its counting sequence is $U(z) = z + z^3 + 2z^5 + 5z^7 + 14z^9 + \ldots$. Derive an explicit expression for $U(z)$.

5.7

Derive an EGF for the number of permutations whose cycles are all of odd length.

5.15

Find the average number of internal nodes in a binary tree of size N with both children internal.

5.16

Find the average number of internal nodes in a binary tree of size N with one child internal and one child external.

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