Computer Science 355

Modern Computer Algebra

Assignment 3

Due date: Feb. 15

Objective: WZ and Z algorithms

Your name:

Problem 1(30 pts)

Prove the identity for $n \geq 2$

$$\sum_{k=0}^{n} \left(18\,k^2 - 9\,k\,n + 3\,k - 8\,n - 12\right) \binom{n+4}{3\,k-n} = 2\,(-1)^n\,(n+3)\,(n+4)$$

Demonstrate each step of the WZ algorithm and provide a certificate.

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Problem 2(30 pts)

Find a recurrence relation for the following sum

$$\sum_k (k^2 - 9k + 4)\binom{n}{k}$$

Demonstrate each step of Zeilberger's algorithm.

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Problem 3(40 pts)

Let $n \geq 0$ be any integer and m be any integer such that

$m \geq n + 1$. Find a recurrence for

$$\sum_{k=0}^{n} \frac{(-1)^k \binom{m}{k} \binom{m-k-1}{n-k}}{k+1}$$

Demonstrate each step of Zeilberger's algorithm.

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