

Analytic Combinatorics Homework 4 Problem 2

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Let $T(z) = 1 + z + 2z^2 + \dots = \frac{1}{2z}(1 - \sqrt{1 - 4z})$ be the Catalan generating function. Then

$$U(z) = z(1 + z^2 + 2z^4 + 5z^6 + \dots) = zT(z^2) = \frac{z}{2z^2}(1 - \sqrt{1 - 4z^2}) = \boxed{\frac{1}{2z}(1 - \sqrt{1 - 4z^2})}.$$