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Step-by-step analitical solutions of the Lane-Emden equation with politropic index 0, 1 and 5 using SymPy

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In the study of the stellar structures, some models arises to explain their interior dynamics and surface consequences (measurable in the laboratory), the Lane-Emden equation provides us with a detailed explanation of the astrophysical properties of these stars based on newtonian self-gravitating, spherically symmetric and polytropic fluid. We present a revisited step by step solution for the well known cases for politropic index n=0 and n=1, and all real solutions for n=5 in terms of Jacobian and Weierstrass elliptic functions. All the calculus are performed using Sympy.

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