Consider $N$ independent random variables $X_1, \ldots, X_N$, each having the same probability distribution $P_X(x)$. If the probability distribution of the random variable $Y_N = X_1 + \cdots + X_N$ can be written in the form $P_Y(y) = P_X(y/c_N + \gamma_N)/c_N$, then $P_X(x)$ is stable. The multiplicative constant must be of the form $c_N = N^{1/\alpha}$, where $\alpha$ is the index of the stable distribution. $P_X(x)$ is strictly stable if $\gamma_N = 0$.

Use the results of [nex19] to determine the indices $\alpha$ of the Gaussian and Lorentzian distributions, both of which are both strictly stable. Show that the Poisson distribution is not stable in the technical sense used here.

Solution: