1. Consider a stationary, autoregressive Gaussian source with mean zero, variance 1 and autocorrelation coefficient $\rho$, which we model as $X_i = \rho X_{i-1} + Z_i$, where $Z_i$'s are IID Gaussian and independent of past $X_i$'s.

(a) Show that for $R \geq \frac{1}{2} \log_2 (1+|\rho|^2)$, the opta function $\delta_X(R)$ for $X$ equals the opta function $\delta_Z(R)$ for $Z$.

(b) Find the rate $R$ at which $\delta_X(R)$ and Zador's function $Z(R)$ differ the most, and find an expression for the maximum difference.

In this problem you may not use high-resolution approximations for the opta functions.