Kullback–Leibler divergence between Gamma and lognormal distributions

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KL Divergence

$$D_{kl}(P_\Gamma||Q_{logNorm}) = \int_0^1 \frac{1}{\Gamma(k)\theta^k} x^{k-1} e^{-x/\theta} \left(\log\left(\frac{1}{\Gamma(k)\theta^k} x^{k-1} e^{-x/\theta} \right) - \log\left(\frac{1}{x\sigma\sqrt{2\pi}} e^{-(\log x - \mu)^2/(2\sigma^2)} \right) \right)$$

Note that in general KL divergence is the mean difference in the log likelihood functions for a hypothetical dataset generated with the distribution of $P(x)$.