Exercise: Gibbs sampling from a 2D Gaussian

Suppose $\mathbf{x} \sim \mathcal{N}(\boldsymbol{\mu}, \boldsymbol{\Sigma})$, where $\boldsymbol{\mu} = (1, 1)$ and $\boldsymbol{\Sigma} = (1, -0.5; -0.5, 1)$. Derive the full conditionals $p(x_1|x_2)$ and $p(x_2|x_1)$. Implement the algorithm and plot the 1d marginals $p(x_1)$ and $p(x_2)$ as histograms. Superimpose a plot of the exact marginals.