Problem 0: Readings
Read note 12 on the course web page.

Problem 1: Rejection sampling
Use a uniform distribution to sample from a beta $Be(2, 1.5)$. Plot a histogram of your samples and verify that it looks like the desired distribution.

Problem 2: Gibbs sampling
Assume we have $n = 12$ observations with a sample mean of 119 and a sample variance such that $(n - 1)s^2 = 13045$. Assume the following independent prior:

\[
\mu \sim N(110, 20)
\]
\[
2700/\sigma^2 \sim \chi^2_{11}
\]
Use Gibbs sampling to find the posterior mean of $\mu$.

Problem 3: Independent sampler
Assume we have 20 observations with $\bar{x} = 0.0675$ and we know that

\[
x_i \sim N(\mu, 1)
\]

The prior for $\mu$ is Cauchy, i.e.

\[
f(\mu) \propto \frac{1}{1 + \mu^2}
\]
Use an independent sampler MCMC to find the posterior mean of $\mu$. 