Week 2 Lab Questions

1. Let y_i $(i = 1, 2, \cdots, n)$ follow a $\mathcal{N}(\mu, \sigma^2)$ distribution given mean parameter μ and variance parameter σ^2.

   (a) Determine Jeffreys' prior for (μ, σ^2).

   (b) Use Jeffreys' prior to compute the conditional and marginal posterior distributions for μ and σ^2 separately.

2. Determine the posterior distribution for a multinomial likelihood and Dirichlet prior.

3. Let y_i $(i = 1, \cdots, n)$ be i.i.d. observations where $y_i|\lambda \sim \text{Exp}(\lambda)$ distribution. Assume the prior distribution for λ is $\text{Ga}(\alpha, \beta)$. Determine the posterior distribution of λ.