Suppose that we have a binomial sampling distribution, $Y \mid p \sim \text{Binomial}(n, p)$, with probability mass function $P[Y = y] = \frac{n!}{(n-y)!y!} p^y (1-p)^{n-y}$.

1. Write down the likelihood.
2. Propose a diffuse prior for p.
3. Write down the posterior (not worrying about the normalizing constant).
4. Suppose that we had selected a Uniform$(0, 1)$ prior distribution for p. Argue why this prior is noninformative. Argue why this prior is not non-informative.
5. Write down the log-likelihood for the binomial sampling distribution.
6. Calculate the Fisher's information for the binomial sampling distribution.
7. Calculate the Jeffreys' prior for the binomial sampling distribution.