1. (Ex8.49) In each of the following situations, calculate the p-value of the observed data.

   (a) For testing $H_0 : \theta \leq \frac{1}{2}$ versus $H_1 : \theta > \frac{1}{2}$, 7 successes are observed out of 10 bernoulli trials.

   (b) For testing $H_0 : \lambda \leq 1$ versus $H_1 : \lambda > 1$, $X = 3$ are observed, where $X \sim Poisson(\lambda)$.

   (c) For testing $H_0 : \lambda \leq 1$ versus $H_1 : \lambda > 1$, $X_1 = 3$, $X_2 = 5$ and $X_3 = 1$ are observed, where $X_i \sim Poisson(\lambda)$, independent.

2. (Ex9.4) let $X_1, \ldots, X_n$ be a random sample from a $N(0, \sigma^2_X)$, and let $Y_1, \ldots, Y_m$ be a random sample from a $N(0, \sigma^2_Y)$, independent of $X$s. Define $\lambda = \sigma^2_Y / \sigma^2_X$.

   (a) Find the level $\alpha$ LRT of $H_0 : \lambda = \lambda_0$ versus $H_1 : \lambda \neq \lambda_0$.

   (b) Express the rejection region of the LRT of part (a) in terms of an $F$ random variable.

   (c) Find a $1 - \alpha$ confidence interval for $\lambda$.

3. (Ex9.6 & 9.7)

   (a) Derive a confidence interval for a binomial $p$ by inverting the LRT of $H_0 : p = p_0$ versus $H_1 : p \neq p_0$.

   (b) Find the $1 - \alpha$ confidence set for $a$ that is obtained by inverting the LRT of $H_0 : a = a_0$ versus $H_1 : a \neq a_0$ based on a sample $X_1, \ldots, X_n$ from a $N(\theta, a\theta)$ family, where $\theta$ is unknown.

4. (Ex9.12) Find a pivotal quantity based on a random sample of size $n$ from a $N(\theta, \theta)$ population, where $\theta > 0$. Use the pivotal quantity to set up a $1 - \alpha$ confidence interval for $\theta$.

5. (Ex9.13) Let $X$ be a single observation from the beta($\theta, 1$) pdf.

   (a) Let $Y = -(\log X)^{-1}$. Evaluate the confidence coefficient of the set $[y/2, y]$.

   (b) Find a pivotal quantity and use it to set up a confidence interval having the same confidence coefficient as the interval in part (a).

   (c) Compare the two confidence intervals.