SAMPLE TEST

1. True or false, and state why:
   a. The significance level of a statistical test is equal to the probability that the null hypothesis is true.
   b. If the significance level of a test is decreased, the power would be expected to increase.
   c. If a test is rejected at the significance level $\alpha$, the probability that the null hypothesis is true equals $\alpha$.
   d. The probability that the null hypothesis is falsely rejected is equal to the power of the test.
   e. A type I error occurs when the test statistic falls in the rejection region of the test.
   f. A type II error is more serious than a type I error.
   g. The power of a test is determined by the null distribution of the test statistic.
   h. The likelihood ratio is a random variable.

2. Given are two coins, coin 0 and coin 1; with respective probabilities of heads 0.5 and 0.75. One of the coins was tossed until a head came up and the total number of tosses, $X$, was recorded. If the prior probabilities are equal, which outcomes favor the hypothesis that coin 0 was tossed and which favor the hypothesis that coin 1 was tossed?

3. Let $X_1, \ldots, X_{25}$, be a random sample from a normal distribution with unknown mean $\mu$ and variance $\sigma^2 = 1$. Write down two different 95% confidence intervals for $\mu$. Express your answers as formulas, not in numerical form.

4. Consider two probability density functions on $[0, 1]$: $f_0(x) = 1$, and $f_1(x) = 2x$. Among all tests of the null hypothesis $H_0: X \sim f_0(x)$ versus the alternative $H_1: X \sim f_1(x)$, with significance level $\alpha = 0.1$, how large can the power possibly be?