2.5 Problems

1. Suppose you have a test statistic that is standard normally distributed under the null hypothesis $H_0$, and that you compute the test statistic’s value to be $-2.43$ for your data.
   
   (a) Compute the 2-sided $P$-value of the data.
   (b) Compute the 1-sided to the right $P$-value of the data.
   (c) Compute the 1-sided to the left $P$-value of the data.
   (d) Interpret your result in terms of evidence about the null hypothesis, using the traditional significance level $\alpha = 0.05$.

2. Repeat Problem 1, only for a test statistic whose distribution under the null hypothesis $H_0$ is a $t$ distribution with 4 degrees of freedom. Continue to assume that the test statistic’s value is $-2.43$.

3. Suppose you have a test statistic that is standard normally distributed under the null hypothesis $H_0$, and that you compute the test statistic’s value to be $1.98$ for your data.
   
   (a) Compute the 2-sided $P$-value of the data.
   (b) Compute the 1-sided to the right $P$-value of the data.
   (c) Compute the 1-sided to the left $P$-value of the data.
   (d) Interpret your result in terms of evidence about the null hypothesis, using the traditional significance level $\alpha = 0.05$.

4. Repeat Problem 3, only for a test statistic whose distribution under the null hypothesis $H_0$ is a $t$ distribution with 11 degrees of freedom. Continue to assume that the test statistic’s value is $1.98$.

5. Suppose you have a test statistic $X$ that is normally distributed with unknown mean $\mu$ and standard deviation $\sigma = 0.74$, and that you have computed the value of $X$ to be $-2.43$ for your data.
   
   (a) Find a level 0.95 confidence interval for $\mu$.
   (b) Find a level 0.90 confidence interval for $\mu$. 


6. Repeat both parts of Problem 5, only now assume that $\sigma$ is not known, but that the sample standard deviation is $s = 0.74$. The number of observations in the sample is 12 and the number of parameters used in describing $\mu$ is 1, so the number of degrees of freedom for the problem equals $12 - 1 = 11$. Continue to assume that the test statistic’s value is $-2.43$. 