1. The longevity of truck tires (in months) has a normal distribution with mean μ months and standard deviation $\sigma = 8.0$ months. Suppose $n = 16$ tires are randomly selected and the sample mean longevity $\bar{x} = 42.5$ months.

   (a) Test $H_0 : \mu = 40$ versus $H_a : \mu \neq 40$ at the $\alpha = 0.05$ significance level. *Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.*

   (b) Based upon your answer in 1a, does the mean longevity μ significantly differ from 40? Why?

   (c) Find a 95% CI for the mean longevity μ.

   (d) Based upon your answer in 1c, does the population mean longevity μ significantly differ from 40? Why?

   (e) Based upon your answer in 1c, will the $p-$value for the test in 1a be less than α or greater than α? Why?

   (f) Find the $p-$value for the test in 1a.

   (g) Based on your answer in (1f), does the population mean longevity μ significantly differ from 40? Why?

2. The diastolic blood pressure, X, of smokers follows a normal distribution with mean μ and standard deviation $\sigma = 15$, i.e. $X \sim N(\mu, \sigma = 15)$. The diastolic blood pressure of 3 randomly selected smokers was:

$$125 \quad 140 \quad 125$$

   (a) Find a 90% CI for the population mean diastolic blood pressure μ.

   (b) Test $H_0 : \mu = 140$ vs. $H_a : \mu \neq 140$ at the $\alpha = 0.10$ significance level. *Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.*

   (c) Find the $p-$value for the test in 2b.

   (d) Based upon your answer in 2c, does the population mean diastolic blood pressure μ significantly differ from 140? Why?

   (e) Based upon your answer in 2a, does the population mean diastolic blood pressure μ significantly differ from 140? Why?

3. In the Iowa Driving Simulator, the number of times the center line is crossed by individuals that are under the influence of alcohol has a distribution that is skewed to the right with mean μ and standard deviation $\sigma = 7$. For the 49 participants that drove after drinking alcohol, the mean number of times the center line was crossed was $\bar{x} = 10$.

   (a) Test $H_0 : \mu = 12$ versus $H_a : \mu \neq 12$ at the $\alpha = 0.05$ significance level. *Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.*

   (b) Based upon your answer in 3a, will the $p-$value for the test be less than α or greater than α? Why?

   (c) Find the $p-$value for the test in 3a.

   (d) Based upon your answer in 3c, does the mean number of crossings μ significantly differ from 12? Why?

   (e) Could we perform the above analysis if the sample size $n < 30$? Explain.

4. A random sample of size n is obtained from a normal distribution with mean μ and standard deviation $\sigma = 12$. A 96.6% confidence interval for μ was computed to be (118.26,126.74). Suppose a researcher wants to test $H_0 : \mu = 125$ versus $H_a : \mu \neq 125$ at the $\alpha = 0.05$ significance level. Find the $p-$value for the test and state your decision and final conclusion.