Homework #4

1. Biologists studying the healing of skin wounds measured the rate at which new cells closed a cut made in the skin of an anesthetized newt. Here are data from a random sample of 18 newts, measured in micrometers (millionths of a meter) per hour:
   29, 27, 34, 40, 22, 28, 14, 35, 26, 35, 12, 30, 23, 18, 11, 22, 23, 33
   (a) Create a QQ plot of the data. Do you think it is reasonable to assume that the population distribution is normal? Explain your answer. (There isn’t a unique “right” answer.)
   (b) Regardless of your answer to (a), assume the population distribution is normal and use that assumption to create a 90% CI for $\mu$. (Use a calculator to find $\bar{x}$ and $s$ and then use the formula provided in class to prepare for exams. Then check your answer with R if you wish.)

2. A pumpkin farmer weighed a simple random sample of size $n = 20$ pumpkins, with these results:
   9.6, 8.8, 5.1, 9.7, 9.1, 8.9, 8, 9.2, 2.7, 9.1, 8.5, 7.3, 9.3, 9.6, 4.1, 9.9, 7.6, 9, 7.2, 8.5
   (a) Create a QQ plot of the weights. Do you think it is reasonable to assume that the population distribution is normal? Explain your answer. (There isn’t a unique “right” answer to this problem.)
   (b) Regardless of your answer to (a), use R to perform the bootstrap with 2000 resamplings to create a 90% CI for $\mu$. (Show your R code and its output.)

3. Most penguin species are not sexually dimorphic, which means they lack obvious outward body characteristics which indicate sex. Observation of behavior or a blood test can determine Penguin sex. A penguin researcher is interested in estimating the proportion of females in a large penguin population. She takes a random sample of $n = 20$ penguins and determines the sex of each one using a blood test. She finds 12 males and 8 females. Let $\pi$ be the proportion of females in the population.
   (a) Compute a numerical point estimate of $\pi$.
   (b) Compute the estimated standard error of your estimate.
   (c) Is it reasonable to compute a 95% CI for $\pi$ using the normal approximation in this case? If it is possible, explain why, and make the CI. If it is not possible, explain why.