Instructions: Answer each question as thoroughly as possible. Round answers to 4 decimal places as needed. Exact answers are best when possible. Be sure to answer all parts of each question.

1. A weather researcher measured the temperature everyday in the month of July one year and found a mean high temperature of 91.7 in a particular city with a standard deviation of 5.6 degrees. Construct an 80% confidence interval for the mean high temperature in July in the same city for any year. (July has 31 days.)

$$(90.382, 95.018)$$

2. A poll is conducted and found that among 850 survey takers, 10% of respondents did not identify as right-handed. Construct a 95% confidence interval for the proportion of the population that is not right-handed.

$$(0.07983, 0.12017)$$
$$\approx (7.98\%, 12\%)$$

3. Explain why a confidence interval is preferred over a point estimate.

it gives more information on the quality of the estimate

4. An exponential distribution has a mean of $E(X) = \frac{1}{\lambda}$. Data from an exponential distribution is collected: $\{3.12, 5.17, 12.06, 18.72, 11.35, 8.04, 4.53, 21.07, 6.61\}$. Use the maximum likelihood function to estimate the parameter λ.

$$\bar{X} = 10.07$$
$$\lambda \approx \frac{1}{10.07} \approx 0.09926$$

$$L = \lambda e^{-\lambda(3.12)} \lambda e^{-\lambda(5.17)} \cdot \lambda e^{-\lambda(12.06)} \cdot \lambda e^{-\lambda(18.72)} \cdot \lambda e^{-\lambda(11.35)} \cdot$$
$$\lambda e^{-\lambda(8.04)} \cdot \lambda e^{-\lambda(4.53)} \cdot \lambda e^{-\lambda(21.07)} \cdot \lambda e^{-\lambda(6.61)} =$$
$$\lambda^9 e^{-\lambda(90.67)}$$

$$90.67\lambda = 9$$
$$\lambda = \frac{9}{90.67} \approx 0.09926$$

$$\frac{dL}{d\lambda} = 9\lambda^8 e^{-\lambda(90.67)} + \lambda^9 (-90.67) e^{-\lambda(90.67)} = \lambda^8 e^{-\lambda(90.67)} (9 - 90.67$$