Name Jerry

Student Number

STA 431s2017 Quiz 2

1. (4 points) Let $X_1, \ldots X_n$ be a random sample (that is, the random variables are independent and identically distributed) from a distribution with density $f(x) = \theta e^{-\theta x}$ for $x > 0$, where $\theta > 0$.

   (a) Derive the maximum likelihood estimator of θ. Show your work, but don't bother with the second derivative test. Your answer is a formula for $\widehat{\theta}$. **Circle your answer.**

$$\frac{d}{d\theta} \ln \prod_{i=1}^{n} \theta e^{-\theta x_i} = \frac{d}{d\theta} \ln\left(\theta^n e^{-\theta \sum_{i=1}^{n} x_i}\right)$$

$$= \frac{d}{d\theta}\left(n \ln\theta - \theta \sum_{i=1}^{n} x_i\right) = \frac{n}{\theta} - \sum_{i=1}^{n} x_i \stackrel{set}{=} 0$$

$$\Longrightarrow \frac{n}{\theta} = \sum_{i=1}^{n} x_i \Longrightarrow \hat{\theta} = \frac{n}{\sum x_i}$$

   (b) Calculate your estimate for the following data. The answer is a number. **Circle your answer.** Data: `2.44, 1.48, 2.96, 1.12`

2. (6 points) This question is based on the SAS part of your homework.

(a) How many pigs were in the sample? The answer is a number from your printout, and it appears in multiple places. **Write the number in the space below.** On the printout, circle the number and write "Question 2a" beside it.

$n = 75$

(b) What is the mean weight of pigs receiving Drug 2? The answer is a number from your printout. **Write the number in the space below.** On the printout, circle the number and write "Question 2b" beside it.

71.88

(c) What is the correlation between mother's weight and pig's weight? The answer is a number from your printout. **Write the number in the space below.** On the printout, circle the number and write "Question 2c" beside it.

$r = 0.453$

Please attach *both* your log file and your output file. Make sure your name appears on both documents. Attach the *log file*, not just a listing of the SAS program.