

HW10

① First, we sort the lifetimes.

$$(X_{(1)}, X_{(2)}, X_{(3)}, \dots, X_{(N)})$$

We expect

$$(F(X_{(1)}), F(X_{(2)}), F(X_{(3)}), \dots, F(X_{(N)}))$$

is an ordered sample from $U[0,1]$

$$F(X_{(k)}) = \frac{k - 1/2}{N}$$

$$X_{(k)} = F^{-1}\left(\frac{k - 1/2}{N}\right)$$

$$1 - e^{-\lambda X_{(k)}} = \frac{k - 1/2}{N}$$

$$\Rightarrow e^{-\lambda X_{(k)}} = 1 - \left(\frac{k - 1/2}{N}\right)$$

$$\Rightarrow -\lambda X_{(k)} = \ln\left(1 - \frac{(k - 1/2)}{N}\right)$$

$$\therefore \lambda = -\frac{\ln\left(1 - \frac{(k - 1/2)}{N}\right)}{X_{(k)}}$$

$$\Rightarrow X(k) = \frac{1}{N} \sum_{n=0}^{N-1} x(n) e^{-j 2 \pi k n / N}$$

The quantile-quantile plot was plotted along with the linear regression in the excel sheet.