# STA 5364, Report 1.15

**Carson Slater** *Baylor University*

**2.1 (p. 57)**

The lifetime of light bulbs follows an exponential distribution with a hazard rate of 0.0001 failures per hour of use.

Therefore the survival function $S(t) = e^{-0.0001t}$.

*(a)*

Find the mean lifetime of a randomly selected light bulb. The mean lifetime of a randomly selected light bulb would be

$$\mu = \int_0^\infty S(t)dt = \int_0^\infty e^{-0.0001t}dt = \frac{1}{0.0001} = 10000 \text{ hours.}$$

*(b)*

Find the median lifetime of a randomly selected light bulb.

For the median survival time, we need to find the value of the survival function that satisfies

$$0.5 = e^{-0.0001t}.$$

So then we have that, solving for $t$ yields.

$$t_{\text{median}} = \frac{\ln(0.5)}{-0.0001} = 6931.472 \text{ hours.}$$

*(c)*

What is the probability a light bulb will still function after 2,000 hours of use?

Assuming it is not given that the light bulb has already been used for 2,000 hours, we use the survival function to show that at time $t = 2000$, the probability of survival is

$$S(2000) = e^{-0.0001(2000)} = e^{-0.2} \approx 0.8187.$$