Homework 1 - Solution

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Due date: Thursday, September 20

1. **Textbook problem 1.3** The investigator of a large clinical trial would like to assess factors that might be associated with drop-out over the course of the trial. Describe what would be the event and which observations would be considered censored for such a study.

   Type solution here

2. Let T be a positive continuous random variable, show $E(T) = \int_0^\infty S(t)\,dt$.

   Show proof here

   $$\int_0^\infty S(t)\,dt = \dots$$

3. Question 2 suggests that the area under the survival curve can be interpreted as the expected survival time. Consider the following hypothetical data set with 10 death times.

   ```
   > dat <- c(43, 110, 113, 28, 73, 31, 89, 65, 66, 76)
   ```

   a. Plot the empirical survival curve.

   Insert codes here

   ```
   > plot(dat)
   ```

   b. Find the expected survival time for the hypothetical data set.

   Insert codes here

   ```
   > plot(dat)
   ```

4. Consider a survival time random variable with hazard $\lambda(t) = \frac{1}{10-x}$ in $[0, 10)$.

   a. Plot the hazard function.

   Insert codes here

   ```
   > plot(dat)
   ```

   b. Plot the survival function.

   Insert codes here

   ```
   > plot(dat)
   ```

5. Consider a survival time random variable with constant hazard $\lambda = 0.1$ in $[0, 5)$, and $\lambda = 0.2$ in $[5, \infty)$. This is known as a piece-wise constant hazard.

   a. Plot the hazard function.

   Insert codes here

   ```
   > plot(dat)
   ```

   b. Plot the survival function.

   Insert codes here

```
> plot(dat)
```