Stat 346 Homework #6

1. You are given the following losses:

   800, 1100, 1300, 2150, 2300, 2450, 2650

   You fit an inverse exponential to the loss distribution using maximum likelihood. Determine the resulting estimate of the probability of a loss below 1000. [.219]

2. The following claim experience is observed:

Claim Size	Number of Claims
0 - 1500	15
1500 - 3000	8
3000 - ∞	3

   You fit an exponential to the claim size distribution using maximum likelihood. Show that 1543.431 is the maximum likelihood estimate for mean claims.

3. You are given:

   - Fourteen lives are subject to the survival function
     $$S(t) = (1 - \tfrac{t}{k})^{\frac{1}{2}}, \qquad 0 \le t \le k.$$
   - The first two deaths in the sample occurred at time t = 12.
   - The study ends at time t = 12.
     Find the maximum likelihood estimate of k. [42]

4. Consider claims following a distribution with the probability density function (PDF) given by:

   $$f(x|\theta) = 2\theta x e^{-\theta x^2}, \quad x > 0$$

   where θ is an unknown parameter.

   Given the following claim amounts:

   100, 150, 200, 250, 300, 350, 400

   Calculate the Value-at-Risk (VaR) at the 95% confidence level for a new claim based on the most. likely value of the unknown parameter.

5. A study on the duration of a particular medical treatment's effect is conducted. The treatment effectiveness duration follows an exponential distribution with mean θ. However, the study faces two constraints:

   (a) Only patients who experience treatment effectiveness for more than 1 month are included in the study (left truncation at 1 month).

   (b) For some patients, the treatment is still effective at the end of the study, marking these data points as right-censored at 6 months.

   Given the following observed effectiveness durations (in months) and noting that two observations are right-censored:

   2, 3, 4, (6+), (6+)

   Determine the MLE for the mean duration θ of the treatment's effectiveness.