Math 473 HW 2 Spring 2023. Due Friday, Feb. 3.

Place your solutions on a separate sheet of paper. DO NOT place solutions side by side. You may use both the front and the back of each sheet.

YOU ARE BEING GRADED FOR WORK NOT JUST THE FINAL ANSWER. As a rule of thumb, you should have some idea of what you were doing, even without the book or notes. You are encouraged to form groups to discuss ideas and HW problems, but do not copy.

1) 1.7. Eleven death times from page 16 of Collett are given below.

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11  13  13  13  13  13  14  14  15  15  17
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a) Following the example done in class, make a table with headers
$t_{(j)}, t_i, d_i, \hat{S}_E(t) = \sum(T_i > t)/n$.

b) Plot $\hat{S}_E(t)$. Is the plot the same as Figure 2.1? (See HW1 5.)

c) Find the 95% classical CI for $S(13)$ based on $\hat{S}_E(t)$.

d) Find the 95% plus four CI for $S(13)$ based on $\hat{S}_E(t)$.

2) 1.20. The following problem gets the lifetable estimator using SAS. The data is on 68 patients that received heart transplants at about the time when getting a heart transplant was new. The following problem gets the lifetable estimator using SAS. See Allison (1995, p. 49-50).

a) Do i) through iii) above the problem in the course notes, and look at iv).

b) From the 1st page of output, *Number Failed* $= d_i$, *Number Censored* $= c_i$, *Effective Sample Size* $= n_i'$, *Survival* $= \hat{S}_L(t_{i-1})$ = estimated survival for the left endpoint of the interval and *Survival Standard Error* $= SE[\hat{S}_L(t_{i-1})]$.

What is $SE[\hat{S}_L(200)]$?

c) From the 2nd page of output, *SDF_LCL SDF_UCL* gives a 95% CI for $S(t_{i-1})$.

What is the 95% CI for $S(200)$ using output?

d) Compute the 95% CI for $S(200)$ using the formula and $SE[\hat{S}_L(200)]$.

e) The SAS program (with plots(s,h)) plots both the survival and the hazard function (scroll down!). From the 2nd page of output, plot MIDPOINT vs HAZARD (so the first point is (25,0.0055)) **by hand**. Connect the dots to make an estimated hazard function. Notice that the estimated hazard function decreases sharply to about 200 days after surgery and then is fairly stable.