

Math 473 HW 4 Spring 2021. Due Friday, Feb. 26.

Exam 1 is Wednesday, Feb. 15.

1) 2.15: This data is from a study on ovarian cancer. There were 26 patients. The variable *futime* was the time until death or censoring in days, the variable *fustat* was 1 for death and 0 for censored, *age* is age and *ecog.ps* is a measure of status ranging from 0 (fully functional) to 4 (completely disabled). Level 4 subjects are usually considered too ill to enter a study such as this one.

a) Copy and paste commands from (<http://parker.ad.siu.edu/Olive/survhw.txt>) for this problem into *R*. Hit **Enter** and a plot should appear. Copy and paste the *R* output (similar to that in problem 2 below but also containing the variable *ecog.ps*). Following the *R* handout used with HW3, click on the plot and hold down the *Ctrl* and *c* buttons simultaneously. Then paste the plot in *Word*. The plot is the Cox regression estimated survival function at the average age (56.17) and average *ecog.ps* (1.462).

b) Now copy and paste the command for 2.15b and place the plot in *Word* as described in a). This plot is the Cox regression estimated survival function at the  $(age, ecog.ps) = (66, 4)$ . Is survival better for  $(56.17, 1.462)$  or  $(66, 4)$ ?

c) Find the ESP and  $\hat{h}_i(t)$  if  $\mathbf{x} = (56.17, 1.462)$ .

d) Find the ESP and  $\hat{h}_i(t)$  if  $\mathbf{x} = (66, 4)$ .

e) Find a 95% CI for  $\beta_1$ .

f) Find a 95% CI for  $\beta_2$ .

g) Do a 4 step test for  $H_0 : \beta_1 = 0$ .

h) Do a 4 step test for  $H_0 : \beta_2 = 0$ .

i) Do a 4 step PLRT for  $H_0 : \boldsymbol{\beta} = \mathbf{0}$ .

	coef	exp(coef)	se(coef)	z	p
age	0.162		1.18	0.0497	

Likelihood ratio test=14.3

2) 2.16: Use the output above which is for the same data as in 1) but only the predictor *age* is used.

a) Find a 95% CI for  $\beta$ .

b) Do a 4 step Wald test for  $H_0 : \beta = 0$ .

c) Do a 4 step PLRT for  $H_0 : \boldsymbol{\beta} = \mathbf{0}$  (for  $\beta = 0$ ). (The PLRT is better than the Wald test in b).)

3) 1.22: This data set is on remission times in weeks for leukemia patients. Twenty patients received treatment A and 20 received treatment B. The predictor *group* was 0 for A and 1 for B.

a) Obtain the SAS program for this problem from (<http://parker.ad.siu.edu/Olive/survhw.txt>). Obtain the output from the program in the same manner as from the SAS handout used with HW2. **This semester, just use the attached output, so skip a).**

b) Do a 4 step Wald test for  $H_0 : \beta = 0$ .

c) Do a 4 step PLRT for  $H_0 : \beta = \mathbf{0}$  (for  $\beta = 0$ ). (The PLRT is better than the Wald test in b).)