Exercise 24: survival analysis

In the period 1962-77 a total of 205 patients with malignant melanoma were operated at Odense University hospital in Denmark. The patients were followed up until death or censoring at the end of the study at 31/12-1977. The data are available at the course web-page.

The coding of the variables are as follows:
1) **status**:   1=death from disease, 2=censored, 4=death from other cause
2) **lifetime**:   time from operation to death or censoring (in years)
3) **ulcer**:   ulceration (1=present, 2=absent)
4) **thickn**:   tumor thickness in mm
5) **sex**:   1=female, 2=male
6) **age**:   age at operation (in years)
7) **grthick**:   grouped tumor thickness (1: 0-1 mm, 2: 2-5 mm, 3: 5+ mm)
8) **logthick**:   logarithm of tumor thickness

As we are interested in the mortality from malignant melanoma, we will in this exercise treat death from other causes as censored observations in the analysis.

a) Make Kaplan-Meier plots for each of the two genders, and test the difference using the logrank test. Discuss the results.

b) Repeat the analysis in a) for each of the three groups of tumor thickness: 0-1 mm, 2-5 mm, and 5+ mm.

c) Repeat the analysis in a) for ulceration. (Ulceration is present if the surface of the melanoma viewed in a microscope shows signs of ulcers and absent otherwise.)

d) Make a univariate Cox regression analysis of each of the covariates sex, tumor thickness and ulceration. For the numeric covariate tumor thickness you should consider whether you ought to use the original version "thickn", the log-transformed version "logthick", or the grouped version "grthick" (as a factor). Interpret the results and compare with the results in a-c.

e) Make a multivariate Cox regression analysis with the covariates mentioned in question d. Interpret the fitted model.