Homework 1 (Due 10pm, March 16, Thursday)

Prob-1 KNNL 1.27 (data set available on course websites)
Prob-2 KNNL 2.27

Prob-3

It is not clear in the description of KNNL 1.27 whether a power analysis and sample size calculation had been performed before the study. Suppose from prior knowledge, we know that the variance of women muscle mass is roughly equal to 81.

a) For the test used for part a of KNNL 2.27, calculate its power at $\beta_1 = -1$, generate the power function and power curve, assuming the sample size is 60 and the same design is used.
b) Suppose from each age group, instead of randomly choosing 15 people, we only choose 8 people. You can design a device to randomly select 8 from15 people in the original study. Now under the new design and new sample size (i.e. 32), repeat part a.
c) Compare your results for parts a and b, and provide your comments on the pros and cons of these two designs.
d) Suppose before the study, the researcher had no idea about how fast or slow women's muscle mass will decrease over ages, and believes even a small rate can be of scientific importance and health consequence. The researcher wanted to make sure that even a rate as small as $\beta_1 = -0.2$ could be interesting and should be discovered and reported if it is true. Was the design in the original study properly powered for the researcher's requirement?
e) If your answer to part d is no, help the researcher re-design the study.
f) Compare and comment on the pros and cons of the three designs above.