READING - Montgomery - Chapters 3, 4, 15

1. Montgomery 3.55, parts (a)-(d) only. Part (e) refers to fitting the model using residual maximum likelihood (REML). You can use either REML or least squares for this problem.

2. You want to compare 5 treatments using a one-way fixed effects model. You want enough replication so that the $F$ test has at least 80% power (at the 5% significance level) when the largest difference between means is 4.4 units. Suppose that $\sigma^2 = 16$. How large must $n$ be? Make sure you state your software input values or hand calculations to receive partial credit.

3. Suppose that this experiment in #2 only has the resources for $n = 15$ observations per group. Sticking with 5% significance, how small a difference in means can this experiment detect with 80% power? Make sure you show your software inputs or hand calculations to receive partial credit.

4. Recall Problem 7 of HW4. There were $a = 6$ randomly chosen schools each with $n = 5$ teachers.

   a. How much power does this study have if the true variances were such that $2\sigma^2_\tau = \sigma^2$? Make sure you show your software inputs or hand calculations to receive partial credit.

   b. In a random effects situation you can either increase $a$ and/or $n$ to increase the power. You investigate different combinations and find the following:

   - $a = 11, n = 5$, 81.6% power
   - $a = 9, n = 6$, 82.2% power
   - $a = 8, n = 7$, 83.7% power
   - $a = 7, n = 8$, 83.6% power

   If it costs $20 in time and resources to evaluate each teacher once at a school and $100 in time and resources to access a school, which of these options would you choose? Explain your answer.

5. Montgomery Problem 15-11. Make sure to check assumptions and perform pairwise comparisons of treatments if appropriate.