Due April 29.

1. Using the Dental Data, fit all the covariance models you can (at least 10). Try various random effects, correlation structures, letting the variance differ by age and/or gender, and even all three at the same time. For the fixed effects, using gender, time, and their interaction.

   (a) Construct a table of the AIC, BIC, and log-likelihood values. Which models do you prefer?

   (b) For your best three models, compare the predicted values and their standard errors for both boys and girls at each age. Are the models qualitatively the same?

2. Consider a stronger transformation for the pediatric pain data. In particular, try the negative inverse square root ($-1/\sqrt{x}$) instead of the log transformation we had been using. For fixed effects, use treatment, coping style, and their interaction, using a treatment of baseline for the first three times as we have done in class.

   (a) Why do you think the negative in this transformation is recommended?

   (b) Make some plots of this new transformation (and maybe the log transformation too). Does the skewness and/or non-constant variance improve?

   (c) Fit all the covariance structures you can to the model (at least 10). Make a table showing your results. How do they compare with the results in the text and/or from class? Are the results qualitatively the same? (Remember that the respones has changed so you can't directly compare these models with the models with the log transformation.

   (d) Back transform to provide predictions on the original scale for the different groups. Are these qualitatively different than the predictions from the log transformation?