Stat 532 **Name:** _____
HW 8
Due 10/30/17

Please prepare your solutions using LaTeX or another word processing software.

1. (10 points) Make your selection for the final project. If you plan to present a paper, state your paper choice for the project. There is a discussion board on D2L to make sure we don't have duplicate selections. If you plan to undertake a Bayesian analysis, describe your dataset and the question you wish to address. Do you have any specific questions or concerns about the project?

2. Read the article titled "Stein's Paradox in Statistics" a copy can be found on D2L.
   (a) (10 points) Briefly describe your thoughts on the article.

   (b) (10 points) How does this article illustrate the concept of shrinkage?

   (c) (10 points) Summarize Stein's Paradox.

3. (30 points) For the hierarchical normal model specified as

$$\begin{aligned} p(y|\theta_j, \sigma^2) &= normal(\theta_j, \sigma^2) \text{ within-group model} \\ p(\theta_j|\mu, \tau^2) &= normal(\mu, \tau^2) \text{ between-group model} \end{aligned}$$

   with the following prior distributions

$$\begin{aligned} \sigma^2 &\sim InvGamma(\nu_0/2, \nu_0\sigma_0^2/2) \\ \tau^2 &\sim InvGamma(\eta_0/2, \eta_0\tau_0^2/2) \\ \mu &\sim normal(\mu_0, \gamma_0^2) \end{aligned}$$

   derive the full conditional distributions for μ, σ^2, τ^2 and θ_j. You can use tricks of normal kernels and moments, but include all necessary work. Paper and pencil is fine for this question.

4. (30 points) Generate data from a two-dimensional hierarchical normal model (e.g. students within a school). Write code for a Gibbs sampler and convince me that your code returns the correct answer.