491 Final Exam

Name:

Please write your name on the top of every page.

Short Answer Questions: #1 - #7 (28 points)

For questions in this section, keep your answers concise. You are welcome to use a combination of prose, math, and pseudocode, but your responses should be well thought out and defended. If the class meets an 80% completion target for course evaluations, you will be able to drop one question of your choice. Please indicate the question you'd like to drop by placing an X through the question number.

1. (4 points)

Are priors a good thing or a bad thing? Explain your reasoning.

2. (4 points)

Do you anticipate most of your future analyses will be Bayesian or frequentist? Either answer can receive full points, but defend your choice.

3. (4 points)

What is a hierarchical model? Give an example of where one might be useful.

4. (4 points)

What is MCMC and why is it useful for Bayesian statistics?

5. (4 points)

What is a posterior predictive distribution and how can it be used to summarize statistical results?

6. (4 points)

Write out the statistical model including any prior distributions implied by the following `JAGS` code.

```
model {
  for ( s in 1:Nsubj ) {
    z[s] ~ dbin( theta[s], N[s] )
    theta[s] ~ dbeta( omega*(kappa-2)+1, (1-omega)*(kappa-2)+1)
  }
  omega ~ dbeta(a, b)
  kappa <- kappaMinusTwo + 2
  kappaMinusTwo ~ dgamma(a, b)
}
```

7. (4 points)

Why can an exact posterior distribution be found for binary data with a beta prior, whereas MCMC is required for logistic regression which also is a model for binary data?

For Questions 8 - 9, follow the narrative below. (8 points)

Your neighbor Zev is a enthusiastic berry forager. Suppose that they ask you to build a model to predict the number of huckleberries they find on a hike. They give you huckleberry totals from 27 hikes from last summer.

8. (4 points)

Write out a statistical model to help Zev estimate the number of berries they would be expected to find. Defend your choice of priors.

9. (4 points)

Write out JAGS code, or suitable pseudocode, to fit this model. Feel free to add comments and note that I'm more worried about structure than exact syntax.