HW 4

Name here

Please use D2L to turn in both the PDF output and your R Markdown file.

Q1. (24 pts)

For this question, consider modeling bat counts using a Poisson distribution as a sampling model.

a. Prior (4 pts)

Select and justify a prior for this setting.

b. Posterior (4 pts)

Using nightly bat counts recorded over a two week period (below), derive a posterior distribution for the mean term in the Poisson distribution.

```
bat.counts <- c(3,3,92,101,54,5,28,2,0,0,6,0)
```

Please formally write out this distribution and create a figure to visualize the distribution.

c. Posterior Predictive Distribution (4 pts)

Use the computational procedure to create a posterior predictive distribution and create a plot of this distribution. With samples from the posterior predictive distribution, compute:

- The probability of new observation in the interval [20, 30]
- The probability of a new observation equal to 2.

d. Posterior Predictive Check (4 pts)

A common model checking diagnostic is to do a posterior predictive check. The goal is to determine whether your posterior predictive distribution is a realistic fit for the data. The idea is that for the model (sampling model + prior) to be reliable, it should be able to generate the actual data. Create a visual comparison of the data and the posterior predictive distribution, what are your observations for the comparison between the posterior predictive distribution and the data?

e. Posterior Summary (4 pts)

Regardless of your results from part d, summarize your posterior distribution for θ, the mean term in the Poisson distribution.

f. MCMC Analysis (4 pts)

Use an MCMC approach, (JAGS or Stan) to compute the posterior distribution. Compare your MCMC results with that from part e.