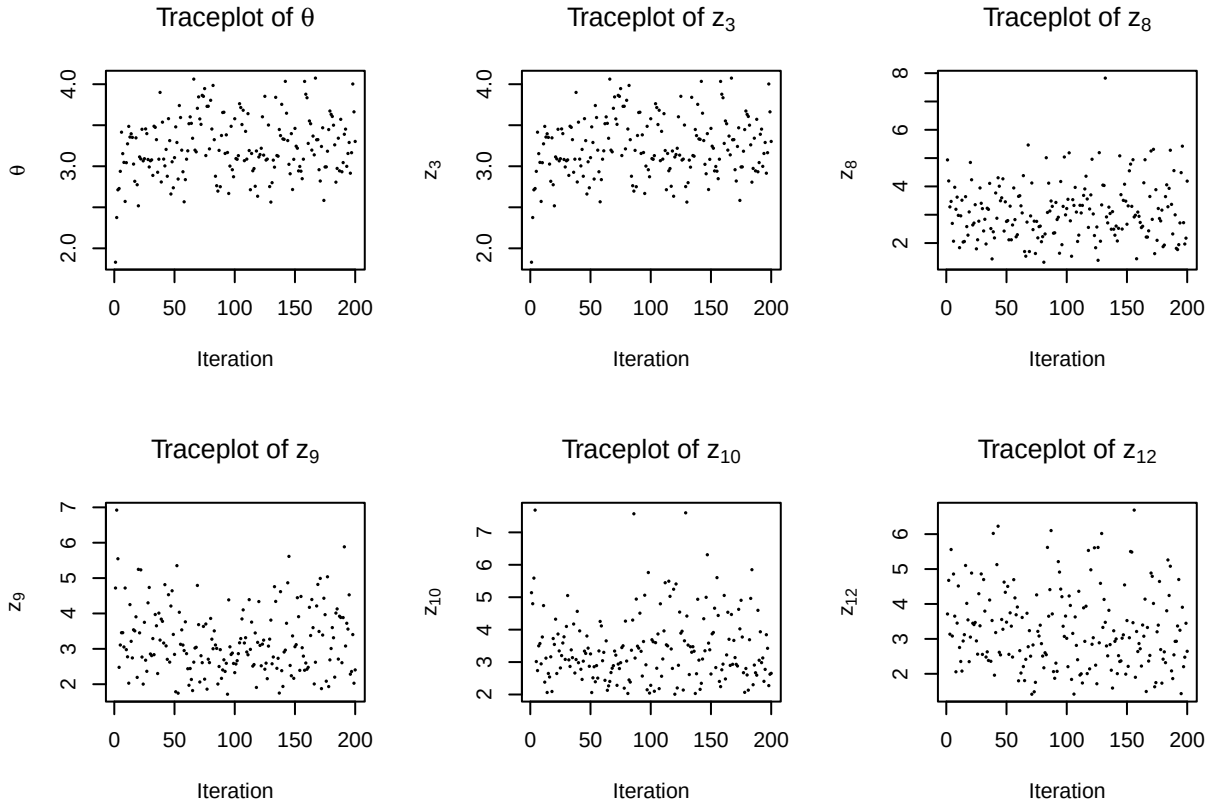
Homework 6, STA 360/602

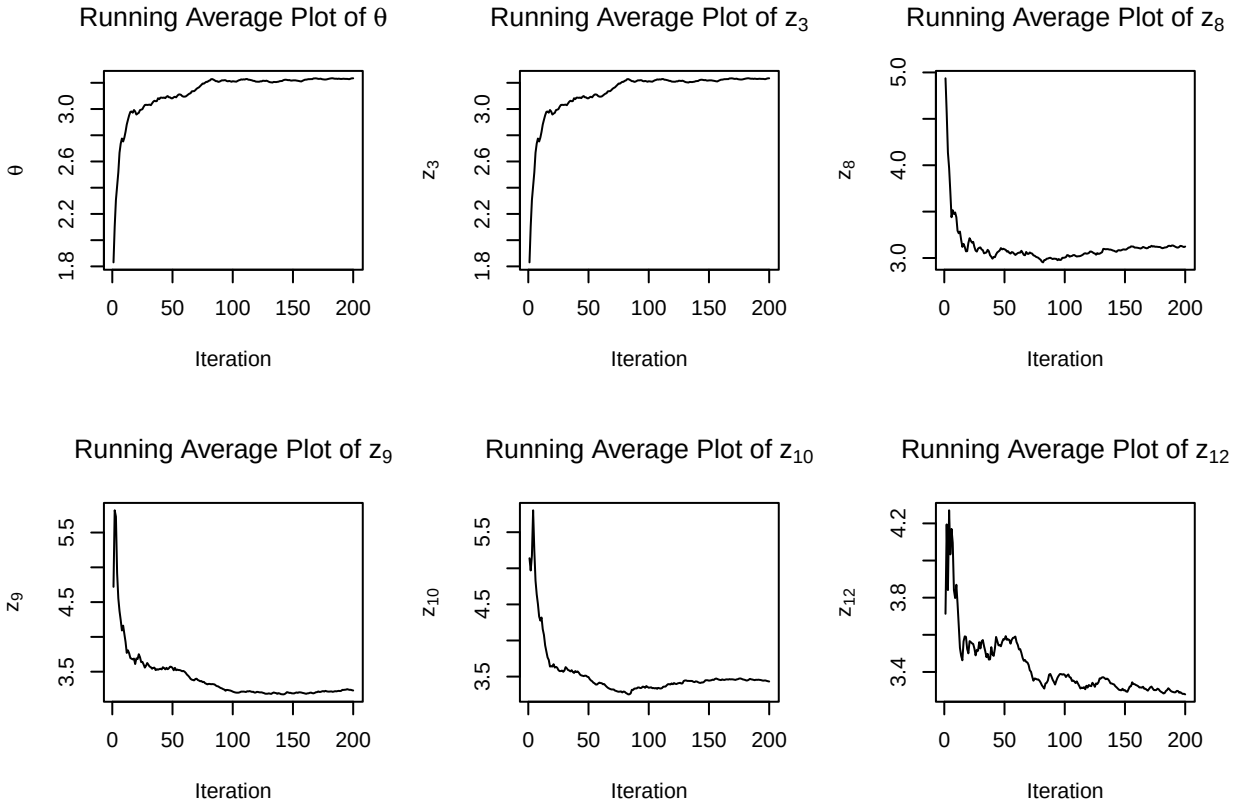
Shenyang Huang

Code adapted from the homework template.

1. (5 points) Write code to produce trace plots and running average plots for the censored values for 200 iterations. Do these diagnostic plots suggest that you have run the sampler long enough? Explain.

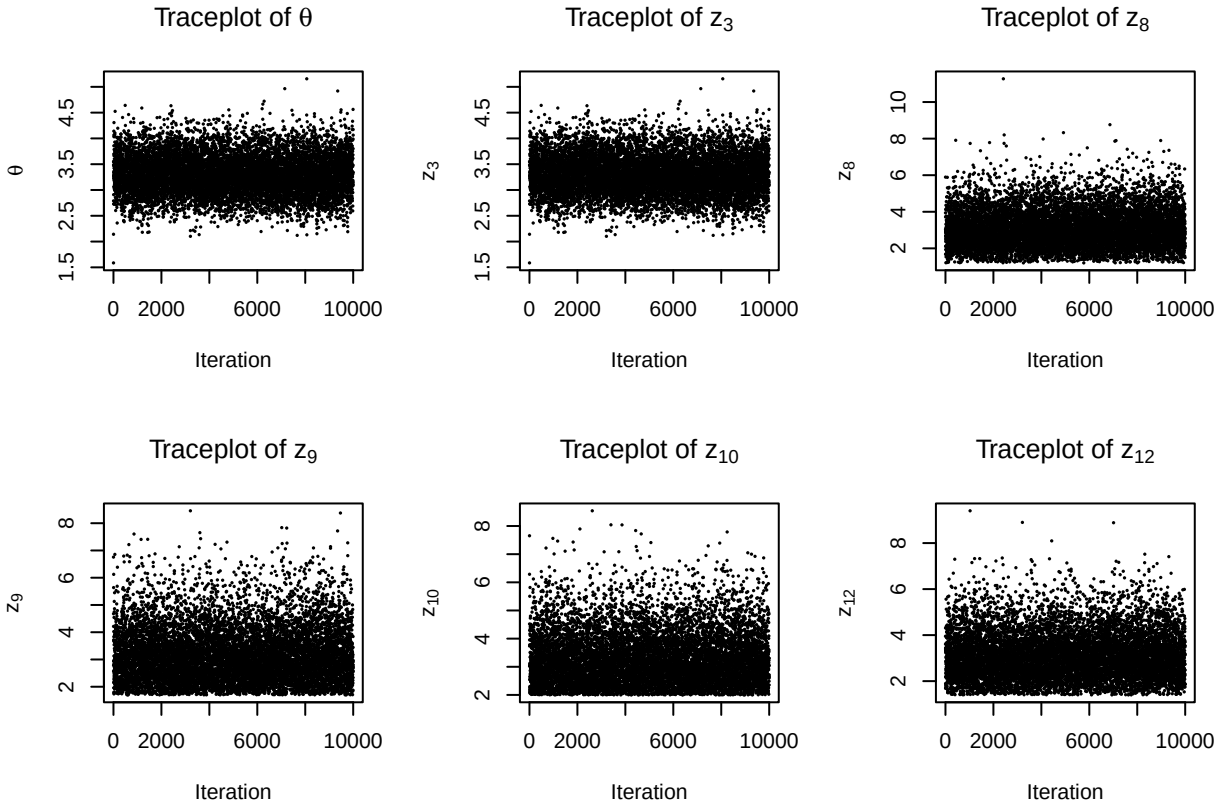


Traceplots for 200 iterations are shown above, and it is difficult to tell whether or not the sampler has failed to converge.

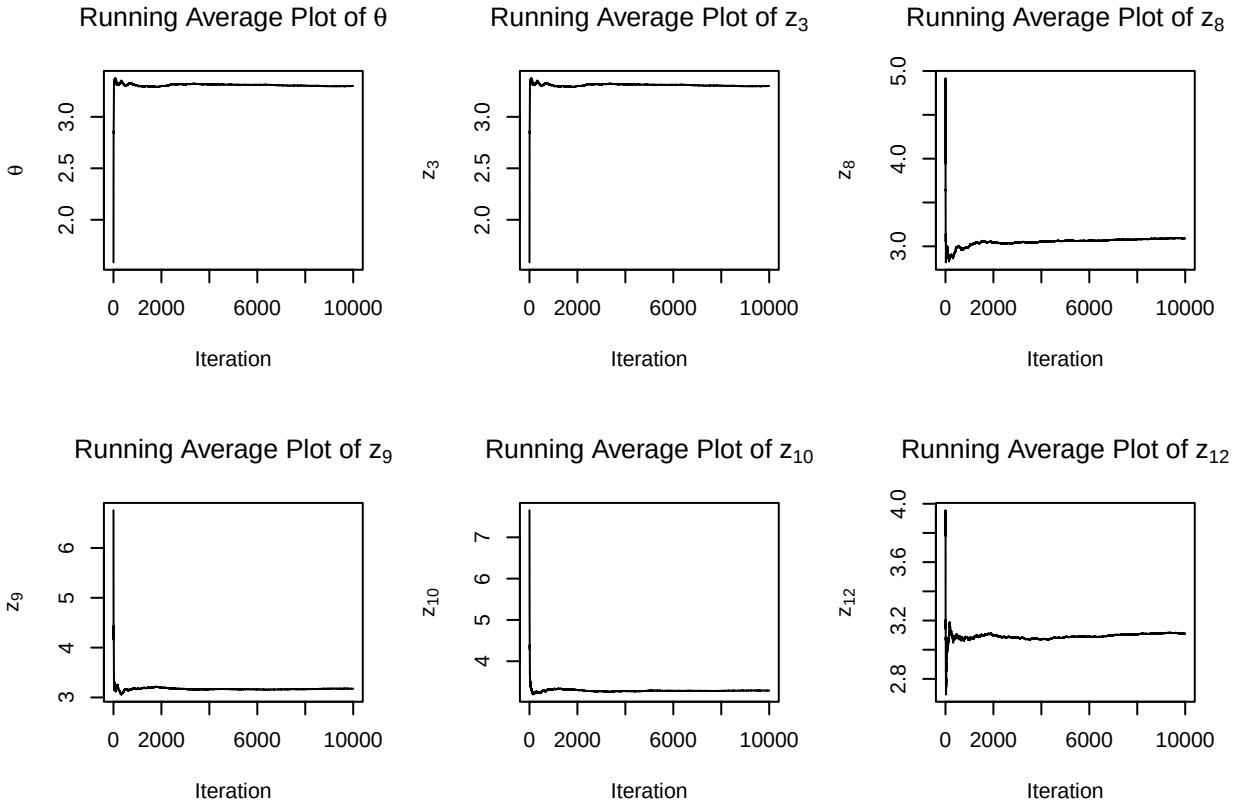


Running average plots for 200 iterations are shown above, and they show that 200 iterations is not long enough as the running averages still do not seem to have converged.

2. (5 points) Now run the chain for 10,000 iterations and update your diagnostic plots (traceplots and running average plots). Report your findings for both traceplots and the running average plots for θ and the censored values. Do these diagnostic plots suggest that you have run the sampler long enough? Explain.

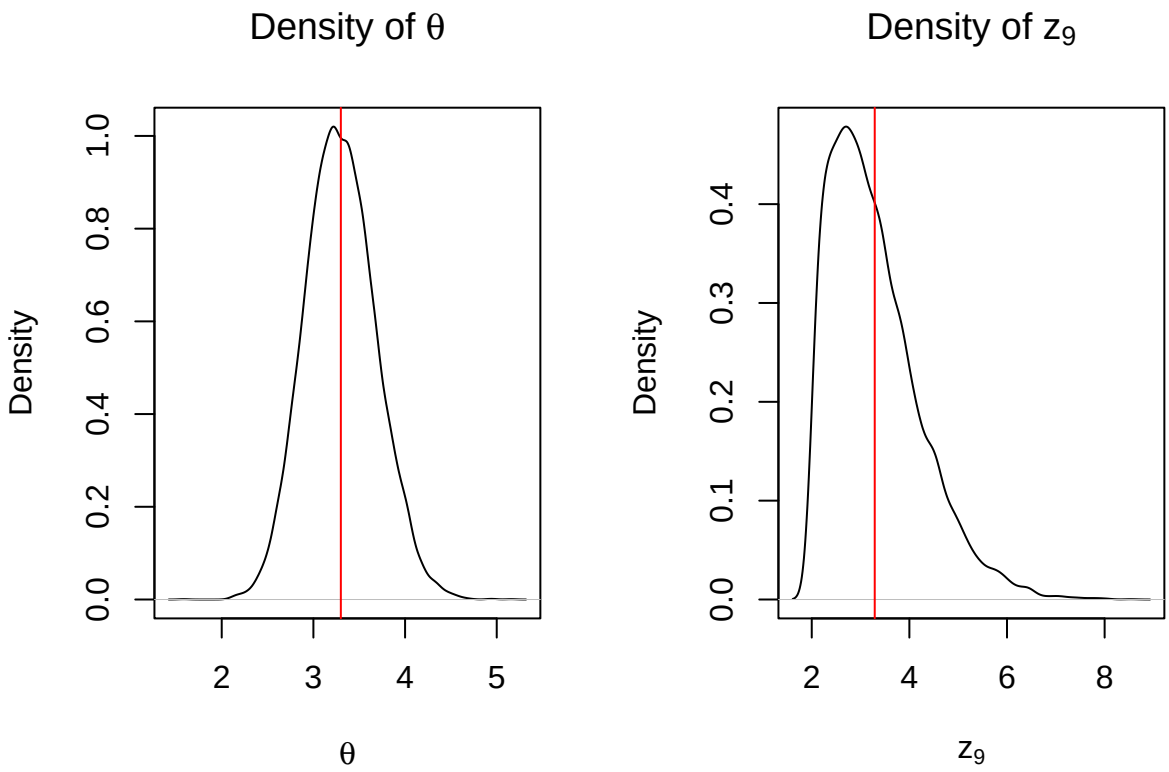


Traceplots for 10000 iterations are shown above, and it is still hard to tell whether the sampler has failed to converge.



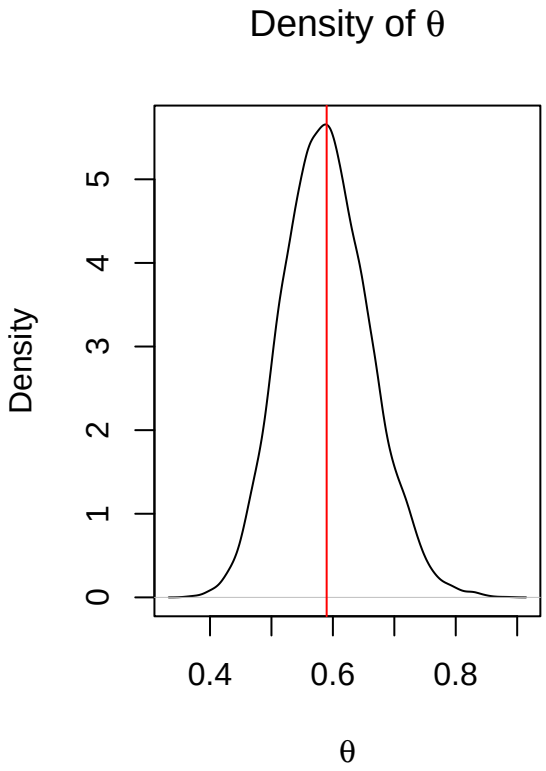
Running average plots for 10000 iterations are shown above, and they suggest that the samplers still have not converged (see the unstable tail of $z_1 2$).

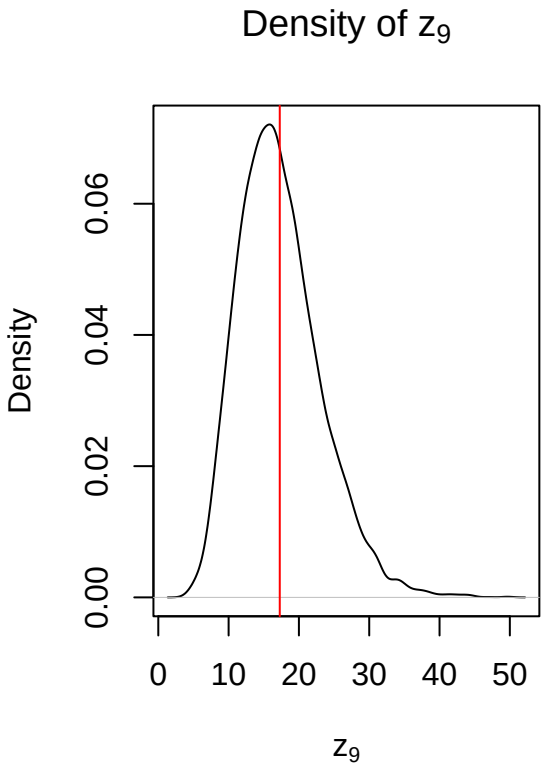
3. (5 points) Give plots of the estimated density of $\theta \mid \cdots$ and $z_9 \mid \cdots$. Be sure to give brief explanations of your results and findings. (Present plots for 10,000 iterations).



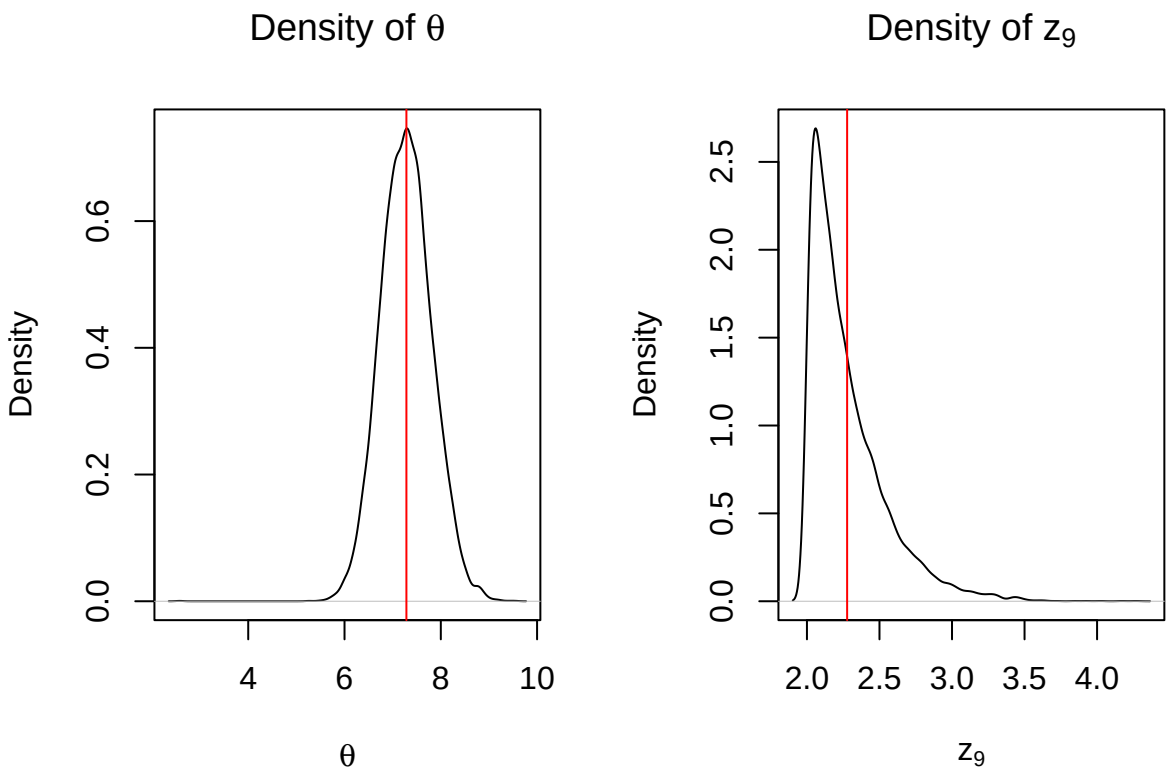
Because the samplers of θ and z_9 have not converged at this point with 10000 iterations, these two density plots do not provide meaningful inference.

4. (5 points) Finally, let's suppose that $r = 10, a = 1, b = 100$. Do the posterior densities in part (c) change for $\theta \mid \cdots$ and $z_9 \mid \cdots$? Do the associated posterior densities change when $r = 10, a = 100, b = 1$? Please provide plots and an explanation to back up your answer. (Use 10,000 iterations for the Gibbs sampler).





r=10, a=1, b=100



r=10, a=100, b=1

- Both posterior densities of θ and z_9 are shifted (see difference in mean indicated by the red line) as the parameters a, b change.
- Parameters a and b are parameters for the prior Gamma distribution of θ
- Because we only have limited fully observed data ($n = 7$), the posterior distribution of θ is highly sensitive to the prior parameters.
- Then, because θ is a parameter for the truncated Gamma distribution from which we interpolate the missing observations, the posterior density of z_9 are also affected.