

Lesson 6

Тест, 8 вопроса

1

Баллы

1.

Why is it important to check your MCMC output for convergence before using the samples for inference?

- ☐ Convergence diagnostics provide a guarantee that your inferences are accurate.
- ☒ If the chain has not reached its stationary distribution (the target/posterior), your samples will not reflect that distribution.
- ☐ Pre-convergence MCMC samples are useless.
- ☐ You can cut your Monte Carlo error by a factor of two if you strategically select which samples to retain.

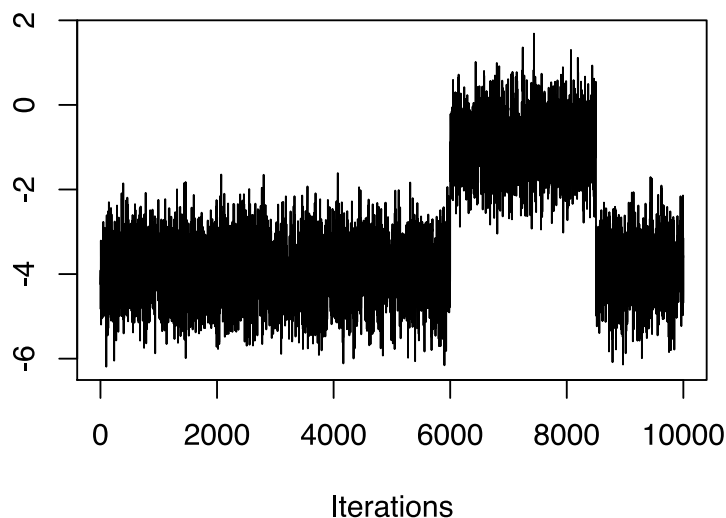
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Баллы

2.

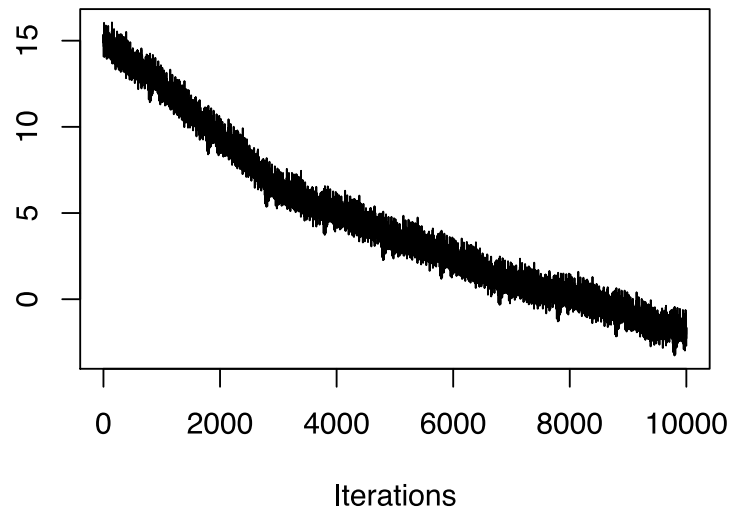
Which of the following trace plots illustrates a chain that appears to have converged?

- ☐ A)

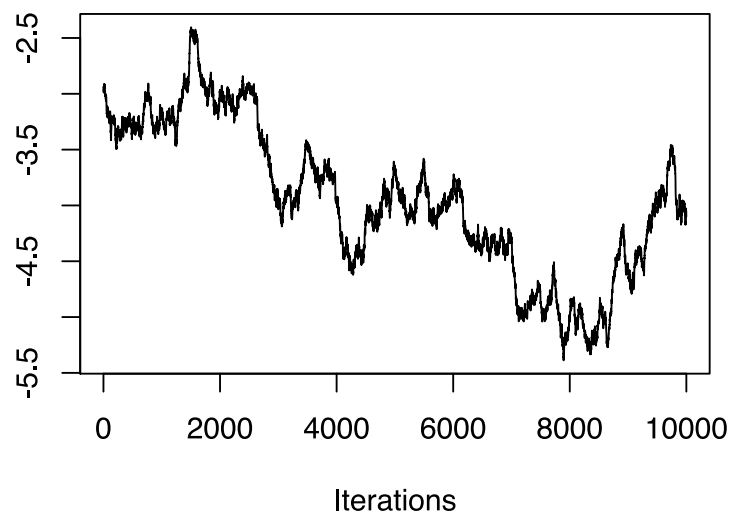


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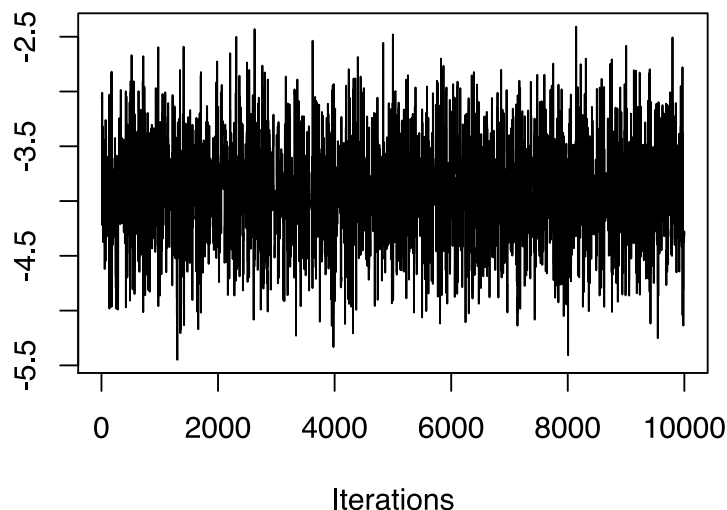
☐ C)



☒ D)

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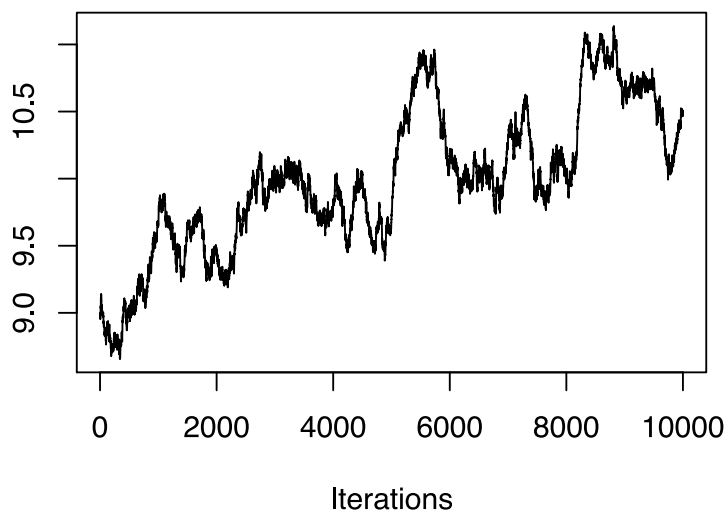


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Баллы

3.

The trace plot below was generated by a random walk Metropolis sampler, where candidates were drawn from a normal proposal distribution with mean equal to the previous iteration's value, and a fixed variance. Based on this result, what action would you recommend taking next?



- ☐ The step size of the proposals is too **small**. **Decrease** the variance of the normal proposal distribution and re-run the chain.
- ☐ The step size of the proposals is too **large**. **Increase** the variance of the normal proposal distribution and re-run the chain.



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The step size of the proposals is too **small**. **Increase** the variance of the normal proposal distribution and re-run the chain.

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4.

Suppose you have multiple MCMC chains from multiple initial values and they appear to traverse the same general area back and forth, but struggle from moderate (or high) autocorrelation. Suppose also that adjusting the proposal distribution q is not an option. Which of the following strategies is likely to help increase confidence in your Monte Carlo estimates?



Retain only the 80% of samples closest to the maximum likelihood estimate.



Run the chains for *many* more iterations and check for convergence on the larger time scale.



Add more chains from more initial values to see if that reduces autocorrelation.



Discard fewer burn-in samples to increase your Monte Carlo effective sample size.

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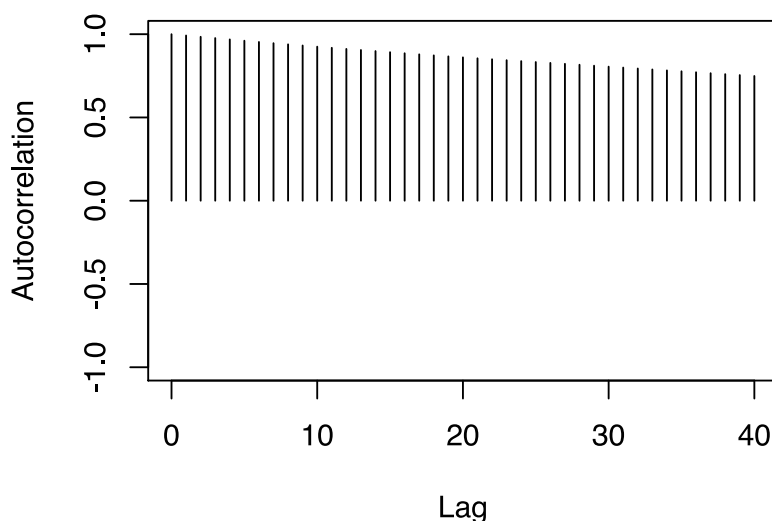
Баллы

5.

Each of the following plots reports estimated autocorrelation from a MCMC chain with 10,000 iterations. Which will yield the lowest Monte Carlo effective sample size?

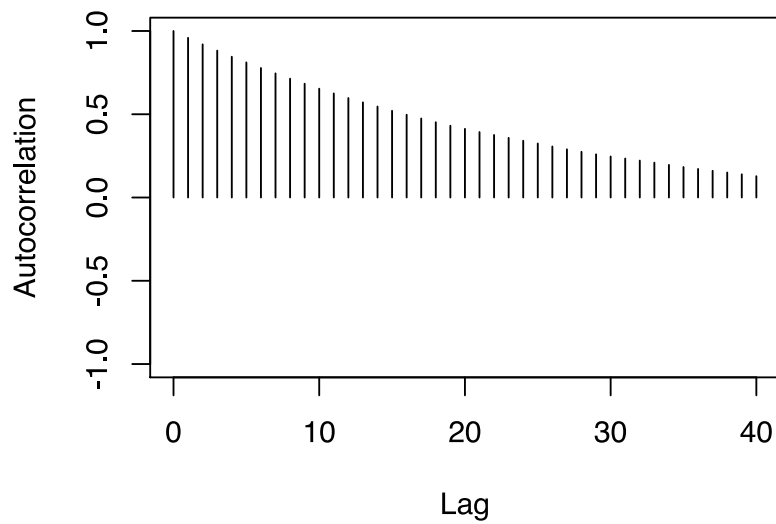


A)

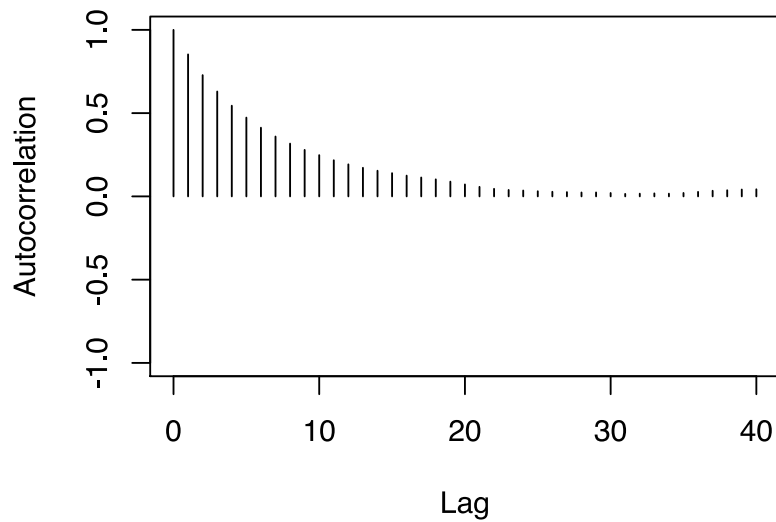


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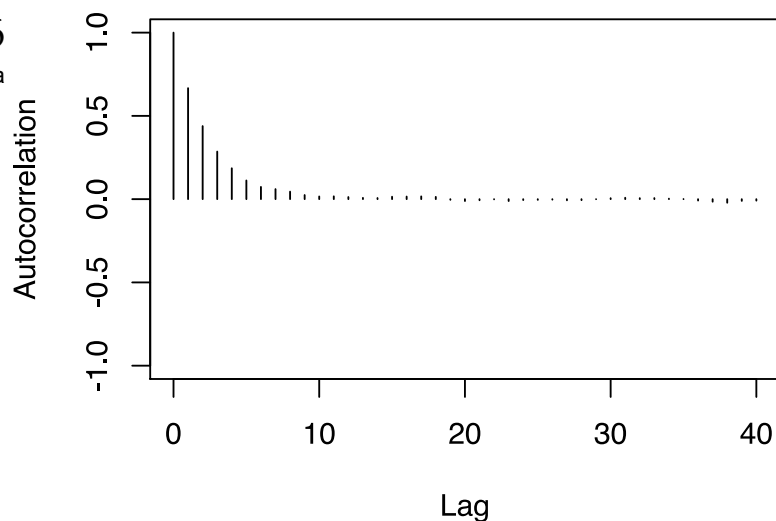
☐ B)



☐ D)

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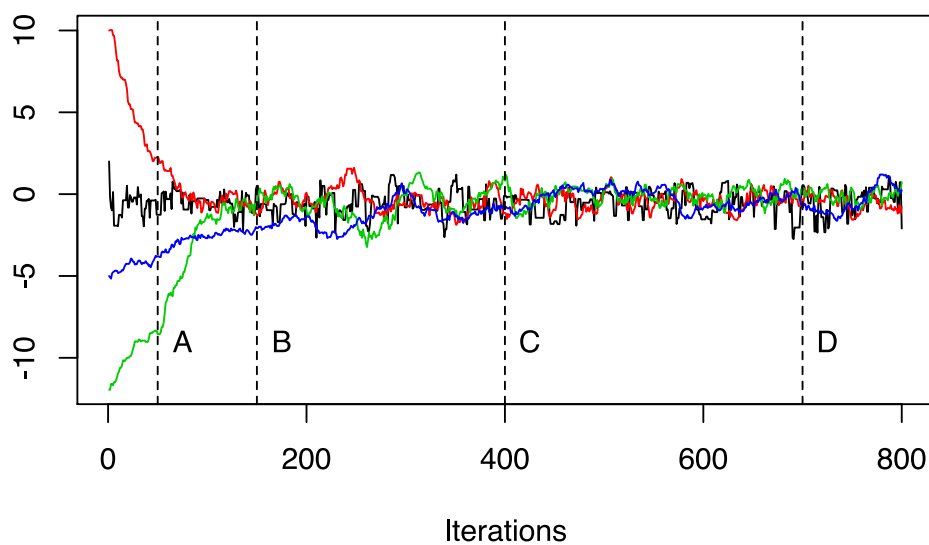


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6.

The following trace plot shows four chains with distinct initial values. Of the choices given, what is the lowest number of samples you would comfortably recommend to discard as burn-in?



A: 50 iterations



B: 150 iterations

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C: 400 iterations

☐ D: 700 iterations

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7.

Suppose the Gelman and Rubin diagnostic computed from multiple chains reports a scale reduction factor much higher than 1.0, say 8.0. What is the recommended action?

- ☐ Use the samples for inference as this high scale reduction factor indicates convergence.
- ☒ Continue running the chain for *many* more iterations.
- ☐ Thin the chain by discarding every eighth sample.
- ☐ Discontinue use of the model, since there is little hope of reaching the stationary distribution.

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8.

Which of the following Monte Carlo statistics would require the largest MCMC effective sample size to estimate reliably? Assume the target distribution is unimodal (has only one peak).

- ☒ 97.5 percentile of the target distribution
- ☐ Median of the target distribution
- ☐ 15 percentile of the target distribution
- ☐ Mean of the target distribution

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