Week 2 Quiz

Quiz, 10 questions

1 point

1.
Which of the following statements is true of a probability mass function but not a probability density function?

- The probability that a random variable X is equal to a specific value x can be greater than zero.
- The probability that a random variable X is between a and b is the area under the function between a and b.
- The function sums to (or integrates to) one over its domain.
- The function takes on only non-negative values.

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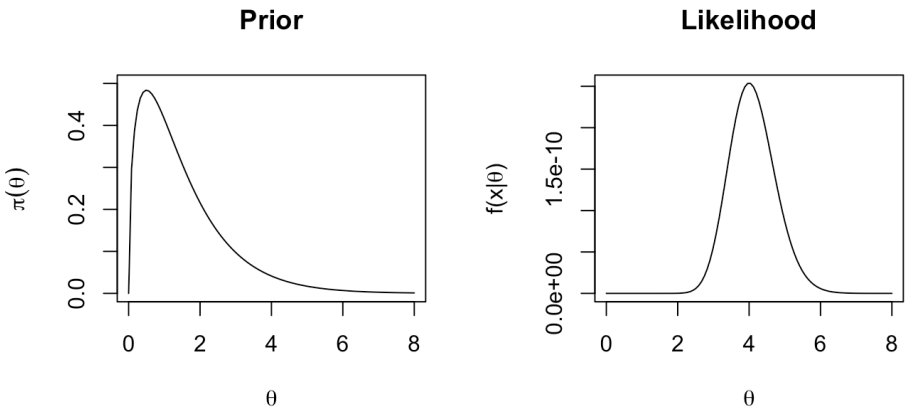
1 point

2.
Below are plots of the prior distribution for a parameter θ and the likelihood as a function of θ based on 10 observed data points.



which of the following is most likely to be the posterior distribution of θ?

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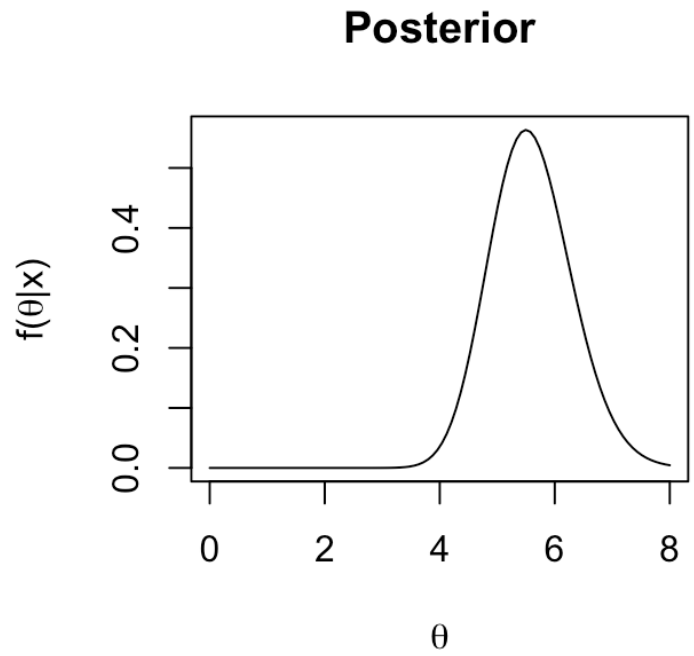

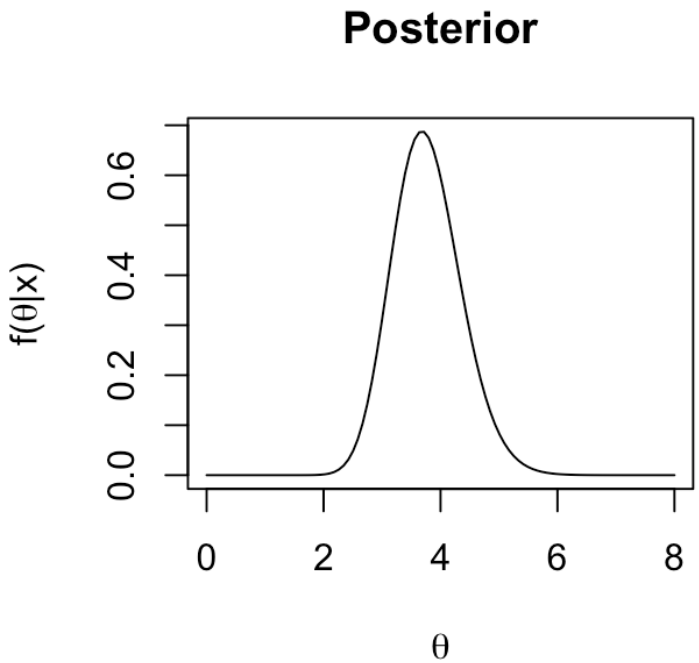

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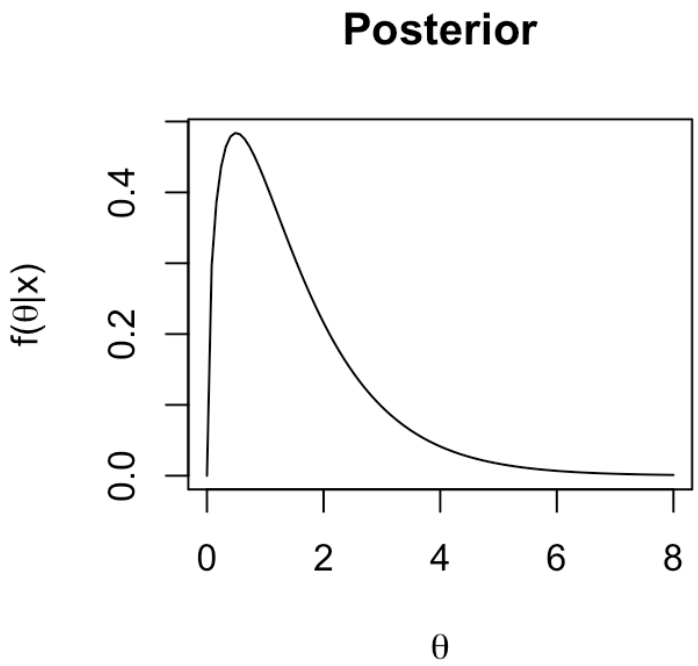

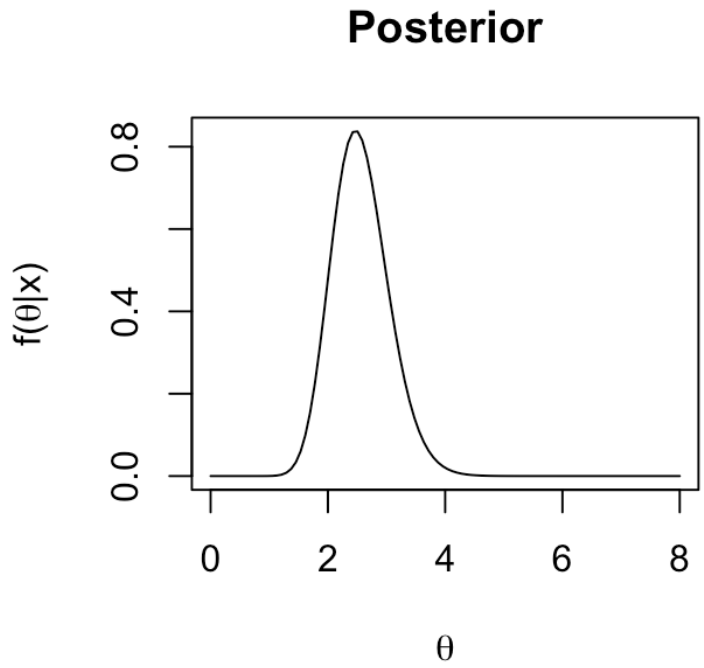

1 point

3.

Which of the following distributions would be a good choice of prior to use if you wanted to determine if a coin is fair when you have a **strong** belief that the coin is biased towards heads? (Assume a model where we call heads a success and tails a failure).

- Beta(10, 90)
- Beta(90, 10)
- Beta(50, 50)
- Beta(9, 1)
- Beta(1, 9)

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1 point

4.

If John is trying to perform a Bayesian analysis to make inferences about the proportion of defective electric toothbrushes, which of the following distributions represents the a conjugate prior for the proportion p ?

- Beta
- Gamma
- Normal
- Poisson

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1 point

5.

You are hired as a data analyst by politician A. She wants to know the proportion of people in Metrocity who favor her over politician B. From previous poll numbers, you place a Beta(40,60) prior on the proportion. From polling 200 randomly sampled people in Metrocity, you find that 103 people prefer politician A to politician B. What is the posterior probability that the majority of people prefer politician A to politican B (i.e. $P(p>0.5 \mid data)$)?

- 0.198
- 0.209

0.664

0.934

1 point

6.

A young meteorologist is trying to estimate the expected number of tropical cyclones that occur in a given year. He assumes that the number of observed tropical cyclones in a year follows a Poisson distribution with rate λ that is consistent across years. Because the meteorologist is inexperienced, he assigns a relatively uninformative $Gamma(k = .5, \theta = 2)$ prior distribution to λ. During his first five years, he observes a total of 49 cyclones. If he were to collect more data about tropical cyclones in future years, what should his prior be?

$Gamma(k = 49.5, \theta = 7)$

$Gamma(k = 49, \theta = 7)$

$Gamma(k = 49.5, \theta = 2/21)$

$Gamma(k = 49.5, \theta = 2/11)$

1 point

7.

Suppose we are interested in modeling the number of airline passenger deaths per year, assuming that the number of deaths follows a Poisson distribution. If we observe data for one year, record a total of 761 deaths, and find that our posterior distribution of the annual rate of passenger deaths λ is $Gamma(862, 12/13)$, what was our conjugate prior distribution?

Gamma(101,12)

Gamma(100, 13)

Gamma(862, 1)

Gamma(761, 1)

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1 point

8.

Suppose that a miner finds a gold nugget and wants to know the weight of the nugget in order to assess its value. The miner believes the nugget to be roughly 200 grams, although she is uncertain about this quantity, so she puts a standard deviation of 50 grams on her estimate. She weighs the nugget on a scale which is known to weigh items with standard deviation 2 grams. The scale measures the nugget at 149.3 grams. What distribution summarizes the posterior beliefs of the miner?

- $Normal(151.25, 1.387^2)$
- $Normal(149.3, 2^2)$
- $Normal(149.56, 1.998^2)$
- $Normal(149.38, 1.998^2)$

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1 point

9.

True or False: When constructing a 95% credible interval, a good rule of thumb is to use the shortest of all such intervals.

- True
- False

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1 point

10.

Suppose you are given a coin and told that the die is either biased towards heads (p = 0.75) or biased towards tails (p = 0.25). Since you have no prior knowledge abou the bias of the coin, you place a prior probability of 0.5 on the outcome that the coin is biased towards heads. You flip the coin twice and it comes up tails both times. What is the posterior probability that your next flip will be heads?

- 3/10
- 1/3
- 2/5