Lesson 5.3-5.4

Quiz, 8 questions

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1.
We use the continuous version of Bayes' theorem if:

- θ is continuous
- Y is continuous
- $f(y \mid \theta)$ is continuous
- All of the above
- None of the above

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2.
Consider the coin-flipping example from the lesson. Recall that the likelihood for this experiment was Bernoulli with unknown probability of heads, i.e.,
$f(y \mid \theta) = \theta^y (1-\theta)^{1-y} I_{\{0 \le \theta \le 1\}}$, and we started with a uniform prior on the interval $[0, 1]$.

After the first flip resulted in heads $(Y_1 = 1)$, the posterior for θ became
$f(\theta \mid Y_1 = 1) = 2\theta I_{\{0 \le \theta \le 1\}}$.

Now use this posterior as your prior for θ before the next (second) flip. Which of the following represents the posterior PDF for θ after the second flip also results in heads $(Y_2 = 1)$?

- $f(\theta \mid Y_2 = 1) = \frac{(1-\theta) \cdot 2\theta}{\int_0^1 (1-\theta) \cdot 2\theta d\theta} I_{\{0 \le \theta \le 1\}}$
- $f(\theta \mid Y_2 = 1) = \frac{\theta \cdot 2\theta}{\int_0^1 \theta \cdot 2\theta d\theta} I_{\{0 \le \theta \le 1\}}$
- $f(\theta \mid Y_2 = 1) = \frac{\theta(1-\theta) \cdot 2\theta}{\int_0^1 \theta(1-\theta) \cdot 2\theta d\theta} I_{\{0 \le \theta \le 1\}}$

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3.
Consider again the coin-flipping example from the lesson. Recall that we used a Uniform(0,1) prior for θ. Which of the following is a correct interpretation of $P(0.3 < \theta < 0.9) = 0.6$?

- (0.3, 0.9) is a 60% credible interval for θ before observing any data.
- (0.3, 0.9) is a 60% credible interval for θ after observing $Y = 1$.
- (0.3, 0.9) is a 60% confidence interval for θ.
- The posterior probability that $\theta \in (0.3, 0.9)$ is 0.6.

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4.
Consider again the coin-flipping example from the lesson. Recall that the posterior PDF for θ, after observing $Y = 1$, was $f(\theta \mid Y = 1) = 2\theta I_{\{0 \le \theta \le 1\}}$. Which of the following is a correct interpretation of $P(0.3 < \theta < 0.9 \mid Y = 1) = \int_{0.3}^{0.9} 2\theta d\theta = 0.72$?

- (0.3, 0.9) is a 72% credible interval for θ before observing any data.
- (0.3, 0.9) is a 72% credible interval for θ after observing $Y = 1$.
- (0.3, 0.9) is a 72% confidence interval for θ.
- The prior probability that $\theta \in (0.3, 0.9)$ is 0.72.

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5.
Which two quantiles are required to capture the middle 90% of a distribution (thus producing a 90% equal-tailed interval)?

- .05 and .95
- .10 and .90
- .025 and .975

0 and .9

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6.
Suppose you collect measurements to perform inference about a population mean θ. Your posterior distribution after observing data is $\theta \mid \mathbf{y} \sim \mathrm{N}(0, 1)$.

Report the upper end of a 95% equal-tailed interval for θ. Round your answer to two decimal places.

Enter answer here

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7.
What does "HPD interval" stand for?

- Highest partial density interval
- Highest point distance interval
- Highest posterior density interval
- Highest precision density interval

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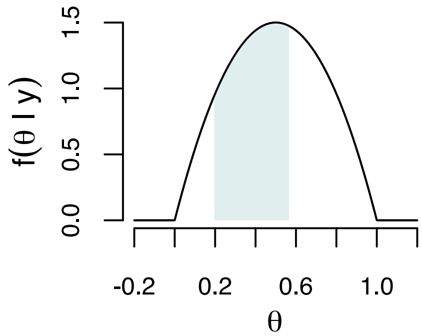
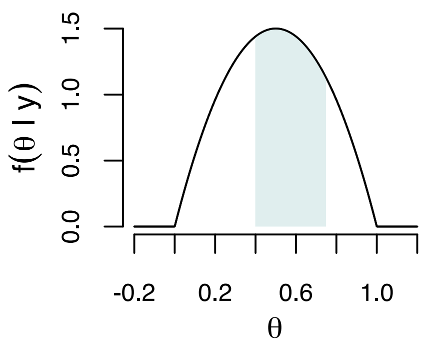
8.
Each of the following graphs depicts a 50% credible interval from a posterior distribution. Which of the intervals represents the HPD interval?

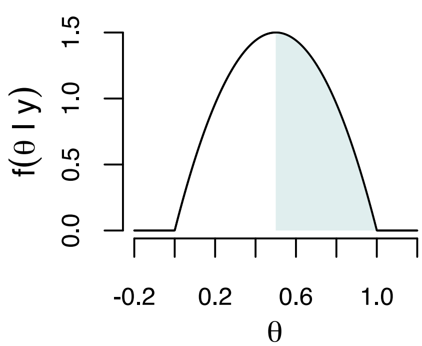
- 50% interval: $\theta \in (0.196, 0.567)$



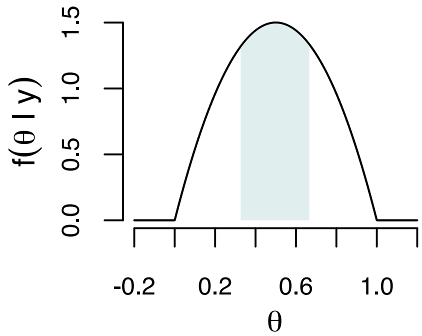
- [ ] 50% interval: $\theta \in (0.400, 0.756)$



- [ ] 50% interval: $\theta \in (0.500, 1.000)$



- [ ] 50% interval: $\theta \in (0.326, 0.674)$



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