Group Work 03

```r
library(bayesrules) # R package for our textbook
library(tidyverse) # Collection of packages for tidying and plotting data
library(janitor) # Helper functions like tidy and tabyl
```

> **Note**
>
> No group problems from Friday

1 BR Exercise 7.6: Proposing a new location

In each situation below, complete Step 1 of the Metropolis-Hastings algorithm. That is, starting from teh given current chain value $\lambda^{(i)} = \lambda$ and with `set.seed(84735)`, use the given proposal model to draw a λ' proposal value for the next value in the chain $\lambda^{(i+1)}$

(a) $\lambda = 4.6, \lambda'|\lambda \sim N(\lambda, 2^2)$
(b) $\lambda = 2.1, \lambda'|\lambda \sim N(\lambda, 7^2)$
(c) $\lambda = 8.9, \lambda'|\lambda \sim Unif(\lambda - 2, \lambda + 2)$
(d) $\lambda = 1.2, \lambda'|\lambda \sim Unif(\lambda - 0.5, \lambda + 0.5)$
(e) $\lambda = 7.7, \lambda'|\lambda \sim Unif(\lambda - 3, \lambda + 3)$
(f) Discuss why these proposal models "make sense"

2 BR Exercise 7.7: Calculate the acceptance probability

Suppose that a Markov chain is currently at $\lambda^{(i)} = 2$ and the proposal for $\lambda^{(i+1)}$ is $\lambda' = 2.1$. For each pair of unnnormalized pdf $f(\lambda)L(\lambda|y)$ and proposal $q(\lambda'|\lambda)$, calculate the acceptance probability α used in Step 2 of the Metropolis-Hastings algorithm.

(a) $f(\lambda)L(\lambda|y) = \lambda^{-1}, \lambda'|\lambda \sim N(\lambda, 2^2)$ with pdf $q(\lambda'|\lambda)$
(b) $f(\lambda)L(\lambda|y) = e^{3\lambda}, \lambda'|\lambda \sim N(\lambda, .5^2)$ with pdf $q(\lambda'|\lambda)$
(c) $f(\lambda)L(\lambda|y) = e^{-1.9\lambda}, \lambda'|\lambda \sim Unif(\lambda - .3, \lambda + .3)$ with pdf $q(\lambda'|\lambda)$

(d) $f(\lambda)L(\lambda|y) = e^{-\lambda^4}, \lambda'|\lambda \sim Exp(\lambda)$ with pdf $q(\lambda'|\lambda)$

(e) For which of these scenarios is there a 100% acceptance probability? Explain why we'd certainly want to accept λ in these scenarios

3 TBA Wed

4 TBA Wed