HW 2 Problems

8. Now, consider the loss function and the prior from the example in Section 4.3. Using the programming language of your choice, reproduce the plot in Figure 3. Do the integrals numerically using a Riemann sum approximation, such as $\int_0^1 f(x)dx \approx \frac{1}{N} \sum_{i=1}^{N} f((i - \frac{1}{2})/N)$ for a suitably large N.

9. Come up with a scenario in which S is discrete but the $0 - 1$ loss would NOT be appropriate, and give an example of the loss function that would be more suitable.

Assessing whether perchlorate is carcinogenic based on rats
Control group (y): 0/30
Exposed group (x): 2/30
$y_i \sim Bern(\theta)$
$x_i \sim Bern(\beta)$

If we choose priors
$\theta \sim Be(1, 299)$
$\beta \sim Be(1, 1)$ [Based on historic data]
then
$\theta|y \sim Be(1, 329)$
$\beta|x \sim Be(3, 29)$

To do:
Estimate and plot density of $\pi(\beta - \theta|y, x)$ in R
Estimate $Pr(\beta > \theta|y, x)$
Estimate 95% credible interval
Repeat for 3 different priors