Plots for hw02

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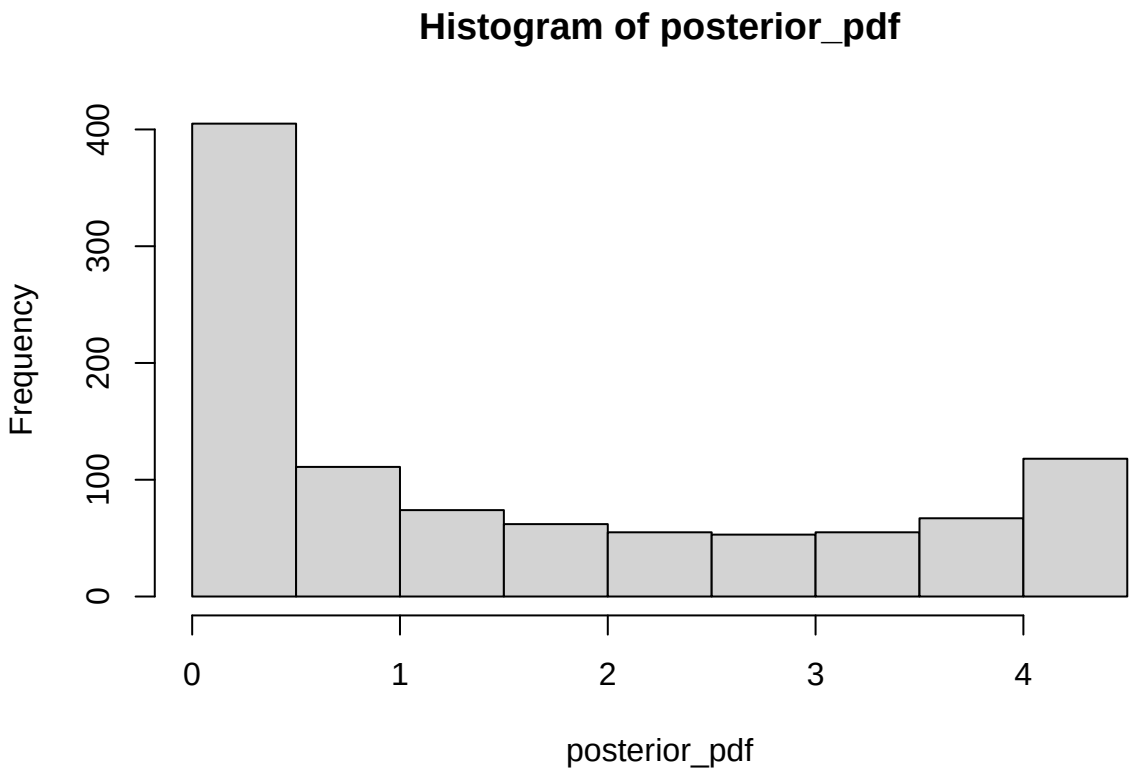
Question 1d

```
# Given data
y_obs <- c(1.7, 5.3, 2.1)  # Observations
b <- 0.5  # Known scale parameter
n <- length(y_obs)  # Number of observations

# Prior parameters (weakly informative)
alpha_0 <- 1
beta_0 <- sum(exp(b * y_obs)) / (2 * n)

# Posterior parameters
alpha_post <- alpha_0 + n
beta_post <- beta_0 - sum(1 - exp(b * y_obs))

# Posterior distribution (Gamma distribution)
posterior_mean <- alpha_post / beta_post
posterior_median <- qgamma(0.5, shape = alpha_post, rate = beta_post)
posterior_sd <- sqrt(alpha_post) / beta_post
posterior_quantiles <- qgamma(c(0.025, 0.5, 0.975), shape = alpha_post, rate = beta_post)

# Display key summary statistics
posterior_summary <- list(
  posterior_mean = posterior_mean,
  posterior_median = posterior_median,
  posterior_sd = posterior_sd,
  posterior_quantiles = posterior_quantiles
)
posterior_summary
```

```
## $posterior_mean
## [1] 0.204326
##
## $posterior_median
## [1] 0.1875744
##
## $posterior_sd
## [1] 0.102163
##
## $posterior_quantiles
## [1] 0.05567196 0.18757437 0.44784545
```

```r
# Generate a histogram for the posterior distribution
x_vals <- seq(qgamma(0.001, shape = alpha_post, rate = beta_post),
              qgamma(0.999, shape = alpha_post, rate = beta_post),
              length.out = 1000)

posterior_pdf <- dgamma(x_vals, shape = alpha_post, rate = beta_post)
hist(posterior_pdf)
```



Question 2c

```r
# Observation
Y <- 4.3

# Compute posterior probabilities
posterior_probs <- numeric(10)
for (j in 1:10) {
  posterior_probs[j] <- 1 / (1 + (Y - j)^2)
}
posterior_probs <- posterior_probs / sum(posterior_probs)  # Normalize

# Compute posterior mean
posterior_mean <- sum(1:10 * posterior_probs)
print(paste0("The posterior mean is ", posterior_mean))
```

```
## [1] "The posterior mean is 4.46766024588916"
```