STAT1651 HW5 R Output

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6.1

d)

```
Y_a <- scan("menchild30bach.dat", quote = "")
Y_b <- scan("menchild30nobach.dat", quote = "")

n_a <- length(Y_a); n_b <- length(Y_b)
ybar_a <- mean(Y_a); ybar_b <- mean(Y_b)
a_theta <- 2; b_theta <- 1
S <- 5000

ab_gamma <- c(8, 16, 32, 64, 128)

theta_diff <- sapply(ab_gamma, function(abg){
  a_gamma <- b_gamma <- abg

  THETA <- numeric(S)
  GAMMA <- numeric(S)

  # starting values
  theta <- ybar_a
  gamma <- ybar_a / ybar_b #relative rate of theta B over theta A

  #Gibbs sampling for thetas iterated 5000 times
  for(s in 1:S){
    theta <- rgamma(
      1,
      a_theta + n_a * ybar_a + n_b * ybar_b,
      b_theta + n_a + n_b * gamma
    )

    gamma <- rgamma(
      1,
      a_gamma + n_b * ybar_b,
      b_gamma + n_b * theta
    )

    THETA[s] <- theta
```

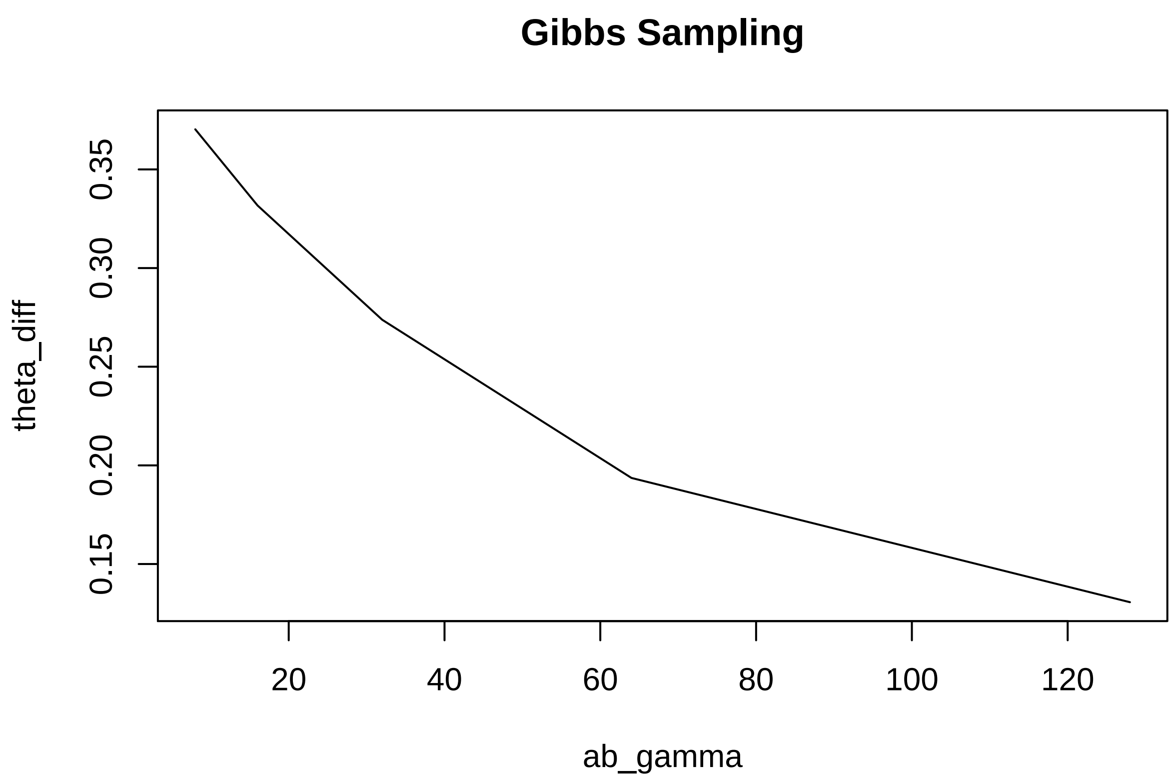
```r
    GAMMA[s] <- gamma

  }

  #final theta values
  THETA_A <- THETA
  THETA_B <- THETA * GAMMA

  mean(THETA_B - THETA_A)
})

plot(main = "Gibbs Sampling",x = ab_gamma, y = theta_diff, type = "l")
```



Since $a_\gamma = b_\gamma$, the gamma distribution is centered around 1 and the values reflect the strength of our belief that $\gamma = \frac{\theta_B}{\theta_A}$ is 1. From the plot above, we can see that as our prior belief of γ increases, the mean posterior $\theta_B - \theta_A$ decreases.