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arsenic <- readRDS("arsenic.RDS")
head(arsenic)
arsenic$gender_numeric <- as.numeric(arsenic$gender == "Male")
arsenic$log_arsenic_toenail <- log(arsenic$arsenic.toenail)
arsenic$interaction <- arsenic$gender_numeric * arsenic$arsenic.water
model_matrix <- model.matrix(~ arsenic.water + age + gender_numeric + interaction,
arsenic)

beta <- solve(t(model_matrix) %*% model_matrix) %*% t(model_matrix) %*%
arsenic$log_arsenic_toenail
residuals <- arsenic$log_arsenic_toenail - model_matrix %*% beta
error_std_deviation <- sqrt(sum(residuals^2) / (nrow(model_matrix) - ncol(model_matrix)))
cat("Coefficients:\n")
print(beta)
cat("Error Standard Deviation:", error_std_deviation, "\n")

# checking with lm
model_lm <- lm(log_arsenic_toenail ~ arsenic.water + age + gender_numeric + interaction,
data = arsenic)
summary(model_lm)

```