Quiz14- MA478

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Let's consider a simple linear regression model, $y_i = \beta_0 + \beta_1 x_i + \epsilon_i$, where we know $\sigma^2 = 1$. You decide to place a $N(0, 10)$ prior on β_0 and a $N(0, 10)$ prior on β_1.

You conduct your experiment 3 times and observe:

$y_1 = 5$, $y_2 = 7$, and $y_3 = 12$ with $x_1 = 1$, $x_2 = 1$, and $x_3 = 0$.

Below is some code for you to estimate the numerator of $p(\beta_0, \beta_1|y)$.

Use this to come up with the most likely value of β_0 and β_1. How does this compare to the least squares estimates of y and x. Change this so you now put a $N(0, 100)$ prior on both β terms and then a $N(0, 1)$ prior. What happens to the estimates of β as the standard deviation of your prior changes? Explain.

```
pb = c()
b0 = c()
b1 = c()

x = c(1,1,0)
y = c(5,7,12)

for(i in 1:100000){
  b_0 = rnorm(1,0,10)
  b_1 = rnorm(1,0,10)
  pr_b1 = dnorm(b_1,0,sqrt(10))
  pr_b0 = dnorm(b_0,0,sqrt(10))
  lik = prod(dnorm(y,b_0+b_1*x,1))
  pb[i] = lik*pr_b1*pr_b0
  b0[i] = b_0
  b1[i] = b_1
}


my.df <- data.frame(b0=b0,b1=b1,post_prob=pb)
```