STA 302 Summer 2001 Quiz One

1. (5 Points) Let $\mathbf{A}$ and $\mathbf{B}$ be $m \times m$ matrices of constants whose inverses exist. Give an expression for $(\mathbf{AB})^{-1}$ in terms of $\mathbf{A}^{-1}$ and $\mathbf{B}^{-1}$. Prove that your expression equals $(\mathbf{AB})^{-1}$. (Remember, to prove $\mathbf{C}^{-1} = \mathbf{D}$, you must show both $\mathbf{DC} = \mathbf{I}$ and $\mathbf{CD} = \mathbf{I}$.)

2. (5 Points) Let $Y_i = \beta_1 x_i + \epsilon_i$ for $i = 1, \ldots, n$, where β_1 is an unknown constant, and $\epsilon_1, \ldots, \epsilon_n$ are independent *normal* random variables with mean = zero and variance = 16. Find the maximum likelihood estimate of β_1. To save time, do not bother with the second derivative test.