Stat 666
HW #1b
Due TBA

1. #4.1 in *RC*
2. #4.4 in *RC*
3. #4.10 in *RC*
4. #4.17 in *RC*
5. For an analysis, you need to invert a very large sample covariance matrix ($p >> 10000$). You have yesterday's matrix inverse based on n observations ($n > p$), where yesterday's covariance matrix is denoted $\mathbf{A}_n$ and the corresponding matrix inverse is denoted $\mathbf{A}_n^{-1}$. Today, you need to get an updated matrix inverse denoted $\mathbf{A}_{n+1}^{-1}$, where the first n observations used to obtain $\mathbf{A}_{n+1}$ are those used to obtain yesterday's inverse matrix ($\mathbf{A}_n^{-1}$), and the final observation $\mathbf{y}_{n+1}$ is newly obtained today. Give a formula for calculating $\mathbf{A}_{n+1}^{-1}$ which does not require any new matrix inversions. Generate an 11×5 matrix $\mathbf{Y}$ in R and show that your formula for calculating the covariance matrix inverse based on all 11 observations can be obtained from the covariance matrix inverse based on the first 10 observations with no additional matrix inversion required. Include your code and output.

   [Hint: use equation (2.77) which is a special case of the Sherman-Morrison-Woodbury formula and a beloved tool for anyone working in statistical computing.]