ST 552 Linear Models Spring 2009

Homework #6 -- due Wednesday, 25 March 2009 *** turn in just starred (*) questions ***

Exercises at the end of Appendix A: 72, 73

Exercises at the end of Chapter 5: 1*(see changes below) , 2, 3, 4, 7*, 11*, 14, 21*, 22, 23
Chapter 5, Exercise 1 * changes *

use new $\mathbf{B} = \begin{bmatrix} 1 & 1 \\ 2 & 0 \\ -1 & 1 \end{bmatrix}$, new $\mathbf{a} = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}$

new g) Find Pr($Y_1 - Y_2 - Y_3 > 1$)
new h) Find Pr($Y_1 - Y_2 - Y_3 = 0$)
parts (i), (j) *optional*

x) Let $\mathbf{u}(T) = \begin{bmatrix} \cos(2\pi T) \\ \sin(2\pi T) \end{bmatrix}$, $\mathbf{v}(T) = \begin{bmatrix} \sin(2\pi T) \\ -\cos(2\pi T) \end{bmatrix}$, where $T \sim$ uniform$(0,\ 1/4)$, so that **u** and **v** are random vectors.
a) Are **u** and **v** orthogonal?
b) Find the mean vectors for **u** and **v**.
c) Find the (4×4) covariance matrix for $(u_1, u_2, v_1, v_2)^T$.
d) Find the correlation or covariance between $\mathbf{a}^T\mathbf{u}$ and $\mathbf{a}^T\mathbf{v}$ where $\mathbf{a} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.
e) Find the correlation or covariance between $\mathbf{b}^T\mathbf{u}$ and $\mathbf{b}^T\mathbf{v}$ where $\mathbf{b} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$.

** Feel free to modify some features of the problem, such as 1/4, sum, difference, to make it more interesting, as long as you conclude that the two linear combinations are NOT uncorrelated. **