18.443. Pset 3. Due Wednesday, Sep 27.

1. page 403, no. 3(b).

2. page 403, no. 4.

3. (Solve this problem by hand without Matlab, but at each linear algebra step write a Matlab function that would do it, like 'sqrtm', 'eig', 'inv', etc.) Suppose that a vector X has normal distribution $N(0, \Sigma)$ with covariance

$$\Sigma = \begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}.$$

(a) Write the joint density $f(x_1, x_2)$ of X.

(b) Find a 2×2 matrix A such that for i.i.d. standard normal vector g, the distribution of Ag is $N(0, \Sigma)$.

(c) What is the distribution of $Y = MX$ where

$$M = \begin{pmatrix} -2 & 1 \\ 1 & -0.5 \end{pmatrix}?$$

Does Y have a density on R^2?

4. page 415, no. 7 (also find the confidence interval for σ^2.) Do it by hand and then use 'normfit' to check your answers.

5. Given a sample of size $n = 15$ from normal distribution what is the probability that the interval

$$\Big[\bar{X} - \frac{\hat{\sigma}}{\sqrt{n-1}}, \bar{X} + 2\frac{\hat{\sigma}}{\sqrt{n-1}}\Big]$$

will cover unknown parameter μ?