18.443. Pset 4. Due Wednesday, Oct. 4.

1. In the confidence interval for variance of normal distribution we find the constants c_1, c_2 such that

$$\chi^2_{n-1}(0, c_1) = \chi^2_{n-1}(c_2, \infty) = \frac{1 - \alpha}{2}.$$

Prove that

$$\lim_{n \to \infty} \frac{c_1}{n} = 1.$$

2. page 409, no. 3.

3. page 513, no. 5.

4. In pset 3, problem 3 (c), a random variable Y has what density on what subspace?

5. Consider positive numbers $a_1, \ldots, a_n > 0$ and consider a nonnegative definite covariance matrix Σ with entries $\Sigma_{ij} = \sqrt{a_i a_j}$, i.e.

$$\Sigma = \begin{pmatrix} \sqrt{a_1 a_1} & \cdots & \sqrt{a_1 a_n} \\ \vdots & \vdots & \vdots \\ \sqrt{a_n a_1} & \cdots & \sqrt{a_n a_n} \end{pmatrix}.$$

Normal distribution $N(0, \Sigma)$ has what density on what subspace? Hint: Find an easy obvious choice of a matrix A such that $\Sigma = AA^T$. This matrix does not have to be square!