# Statistics 9924a Assignment 1

Handout date: 24 September, 2014
Due date: two weeks from the handout date

Problems from the text.

1. Consider vectors in $R^3$. Consider vectors $x^T = (1, 2, 2)$ and $y^T = (1, 0, 0)$. Give the Householder matrix, say $H$, that maps $x/||x||$ into $y$. For this part give the algebraic form, ie find $P$ by *hand or exact calculation.* Verify that $H$ is orthogonal; for this part you can use R to do the numerical calculations. Verify by matrix multiplication that $\frac{1}{||x||}Hx = y$. Will this property hold in general for another vector $z$ such that $||z|| = ||y||$? Explain why or why not and give if possible a vector $z$ such that $Hz \neq y$.

2. 1.9.8

3. 1.9.10

4. 1.9.11 (a)-(d)

5. 1.9.13

6. This question refers to Sections 1.3.2 - 1.3.5.

   Using (1.7) give the marginal distribution of $\hat{\beta}_j - \beta_j$ and which part of the matrix $R^T R$ or $X^T X$ is used for this marginal. Using the properties from Section 1.3.2

why does the displayed expression a few lines from the bottom of p 14 have a student's t distribution. Recall a student's t r.v. is a ratio of certain independent r.v.s.

For the hubble data consider the model

$$Y_i = \beta_0 + \beta_1 x_i + \epsilon_i$$

where $\epsilon_i$ are iid $N(0, \sigma^2)$. Give the marginal distributions for the estimators for each component of $\beta$. It will involve the unknown $\sigma^2$ and a number that you will extract from a function of the design matrix or $R$.

Give the marginal 95% confidence interval for $\beta_1$.