STAT 425 HW#2

TIANQI WU

Problem 4:

$$F = \frac{MS(reg)}{MS(err)} = \frac{FSS/(P-1)}{RSS/(n-P)} = \frac{(TSS-RSS)}{RSS} \cdot \frac{n-P}{P-1} \quad ①$$

$$R^2 = \frac{FSS}{TSS} = \frac{TSS-RSS}{TSS}$$

$$\frac{R^2}{1-R^2} = \frac{(TSS-RSS)/TSS}{RSS/TSS} = \frac{TSS-RSS}{RSS}$$

Plug in ①:

$$F = \frac{R^2}{1-R^2} \cdot \frac{n-P}{P-1}$$

where n is # of observations,
P is # of Predictors.

Problem 6:

Since $\hat{Y} = HY$

$$\begin{aligned} Var(\hat{Y}|X) &= Var(HY|X) \\ &= H^TH\, Var(Y|X) && \text{since } H \text{ only depends on } X. \\ &= H\, Var(Y|X) && \text{since } H^TH = HH = H \\ &= H\sigma^2 && \text{since } Var(Y|X) = \sigma^2 I \end{aligned}$$