

**STA304/1003 H1F - Summer 2014:**  
**Surveys, Sampling, and Observational Data**

**Supplementary Exercise # 3**

1. For Stratified Random Sampling (STRS):
  - (a) Show  $\hat{t}_{str}$  is unbiased.
  - (b) Derive  $V(\hat{t}_{str})$ .
  - (c) Show  $\bar{y}_{str}$  is unbiased.
  - (d) Derive  $V(\bar{y}_{str})$ .
2. Why do you not have to bother with formulas for  $\hat{p}_{str}$ ?
3. Prove that in a self-weighting sample,  $\bar{y}_{str}$  is the average of all observations in the sample.
4. Suppose we know a population is divided into 2 strata. The strata variances are unknown, but  $S_2^2 = kS_1^2$ . Each member of the population costs the same to interview and there is enough money to interview  $n$  people.
  - (a) What relative sample sizes should be chosen to make the estimate of the population mean as precise as possible?
  - (b) What value of  $k$  yields proportional allocation?