STA 575 Practice Problems 2

1. This question refers to material in Chapter 7.
a. If μ_X is not available, can one still form an estimate of R using auxiliary data? Explain.
b. If μ_X is not available, can one still form an estimate of μ using auxiliary data? Explain.
c. Under what conditions is s_r^2 exactly the same as the sample variance of the y-values?
d. Under what conditions is $\widehat{\mu}_r$ exactly the same as the SRS estimate of μ?

2. This question refers to material in Chapter 8.
a. Why divide by $n-2$ in $\widehat{Var}(\widehat{\mu}_L)$?
b. Is $\widehat{\mu}_L$ always a better estimator than $\widehat{\mu}_r$? Explain.
c. If in part **b.** you answered yes, why bother even considering $\widehat{\mu}_r$? Explain.
d. Why employ mean-squared error as a "measure of goodness" when comparing point estimators? Explain.
e. As n and N go to infinity, does the bias of $\widehat{\mu}_L$ go to zero? Explain.

3. This question refers to material in Chapter 11.
a. Provide a specific example (i.e., specify L, N_h, n_h, and σ_h^2) where $\overline{y}_{st}$ is a better estimator than $\overline{y}$.
b. Provide a specific example (i.e., specify L, N_h, n_h, and σ_h^2) where $\overline{y}$ is a better estimator than $\overline{y}_{st}$.
c. If $L = 1$, is $\overline{y}_{st}$ simply the ordinary sample mean? Explain.
d. Provide an equation relating σ^2 to σ_h^2.

4. This question refers to material in Chapter 12.
a. Describe in words the meaning of σ_u^2 and σ^2.
b. In systematic sampling, is it true that $\sigma_u^2 > \sigma^2$?
c. Under what conditions is cluster sampling "better" than systematic sampling?
d. Think of a few ways of defining "better" in part **c.** above. In other words, what do we mean by "better"?

5. Crop yield for a large field of wheat is to be estimated by sampling small plots within the field while the grain is ripening. The field is on sloping land, with higher fertility toward the lower side. Do you think simple random sampling, stratified random sampling, or systematic random sampling will be more effective in estimating τ, the total wheat yield? Please provide a detailed explanation.