Problem Set #2

(1) Stock and Watson, 2.2

(2) Stock and Watson, 2.8

(3) Stock and Watson, 2.10

(4) Show that
\[ \text{Cov}(aX + b, cY + d) = ac\text{Cov}(X, Y) \]
for any two random variables $X$ and $Y$, and constants $a, b, c$ and $d$.

(Hint: Use the formula for the covariance in your class notes. A similar derivation is also provided in the appendix of Chapter 2.)

(5) Show that $\text{Var}(aX + Y) = a^2\text{Var}(X) + 2a\text{Cov}(X, Y) + \text{Var}(Y)$ for any two random variables $X$ and $Y$, and constants $a$ and $b$.

(6) Consider the following two estimators of a parameter $\theta$, and let $n$ denote the sample size:
(a) 
\[ \hat{\theta} = \theta + (1/n) \]
(b) 
\[ \hat{\theta} = \begin{cases} 
\theta + n & \text{With probability .5} \\
\theta - n & \text{With probability .5}
\end{cases} \]

Are these estimators biased or unbiased? Are they consistent or inconsistent?.