Quantitative Method
Assignment 4
Due November 7, 2006

1. Explain why

   (a) $\mathbf{x}'\mathbf{A}\mathbf{x} = \mathbf{x}'\mathbf{A}'\mathbf{x}$, even when A is not symmetric.

   (b) $\mathbf{x}'\mathbf{B}\mathbf{x} = \mathrm{tr}(\mathbf{B}\mathbf{x}x')$

2. Prove that if $\mathrm{tr}(\mathbf{A}\mathbf{A}') = 0$, then $\mathbf{A} = \mathbf{0}$.

3. Show that $(\mathbf{I} + \mathbf{A}\mathbf{A}')$ is p.s., for real **A.**

4. Using $\mathbf{x}' = [1 \quad 3 \quad 5 \quad 7 \quad 9]$, derive or state the numerical value of **A**, **B**, and **C** such that

   (a) $1^2 + 3^2 + 5^2 + 7^2 + 9^2 = \mathbf{x}'\mathbf{A}\mathbf{x}$;

   (b) $(1+3+5+7+9)^2 = \mathbf{x}'\mathbf{B}\mathbf{x}$

   (c) $(1-5)^2 + (3-5)^2 + (5-5)^2 + (7-5)^2 + (9-5)^2 = \mathbf{x}'\mathbf{C}\mathbf{x}$