Theory of Matrices, MATH 5090, Summer 2020

Homework 3, Section 2.3

Due Friday, June 19

Write in complete sentences!!! *Explain* what you are doing and convince me that you understand what you are doing and why. Justify all steps by quoting relevant results from the textbook or hypotheses.

2.14. Let x and y be n-vectors. Prove $(x+y)_c = x_c + y_c$. Use vector notation and products.

2.16. Use Theorem 2.3.1 to prove that for all x and y n-vectors and $a \in \mathbb{R}$

$$V(ax+y) = a^2 V(x) + V(y) + 2a\frac{\langle x_c, y_c\rangle}{n-1}.$$

2.1.17. Prove that for n-vectors x and y, $(\mathrm{Cov}(x,y))^2 \leq V(x)V(y)$.

2.3.A. Prove Theorem 2.3.1(4) (Properties of Covariance). Let x, y, z be n-vectors and let $a \in \mathbb{R}$. Then:

$$\mathrm{Cov}(x+z, y) = \mathrm{Cov}(x,y) + \mathrm{Cov}(z,y),$$

in particular $\mathrm{Cov}(x+y, y) = \mathrm{Cov}(x,y) + V(y)$ and $\mathrm{Cov}(x + a1_n, y) = \mathrm{Cov}(x,y)$.