

Theory of Matrices, MATH 5090, Summer 2018

Homework 3, Section 2.3

Due Thursday, June 14 at 1:00

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 $(x + y)_c = x_c + y_c$.

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

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

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

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:

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

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