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Unit overview

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## Problem 6: Correlation coefficients

(6/6 points)

Consider the random variables  $X$ ,  $Y$  and  $Z$ , which are given to be pairwise uncorrelated (i.e.,  $X$  and  $Y$  are uncorrelated,  $X$  and  $Z$  are uncorrelated, and  $Y$  and  $Z$  are uncorrelated). Suppose that

- $\mathbf{E}[X] = \mathbf{E}[Y] = \mathbf{E}[Z] = 0$ ,
- $\mathbf{E}[X^2] = \mathbf{E}[Y^2] = \mathbf{E}[Z^2] = 1$ ,
- $\mathbf{E}[X^3] = \mathbf{E}[Y^3] = \mathbf{E}[Z^3] = 0$ ,
- $\mathbf{E}[X^4] = \mathbf{E}[Y^4] = \mathbf{E}[Z^4] = 3$ .

Let  $W = a + bX + cX^2$  and  $V = dX$ , where  $a$ ,  $b$ ,  $c$ , and  $d$  are constants, all greater than 0.

Find the correlation coefficients  $\rho(X - Y, X + Y)$ ,  $\rho(X + Y, Y + Z)$ ,  $\rho(X, Y + Z)$  and  $\rho(W, V)$ .

1.

$$\rho(X - Y, X + Y) = \boxed{0} \quad \checkmark$$

2.

$$\rho(X + Y, Y + Z) = \boxed{1/2} \quad \checkmark$$

3.

$$\rho(X, Y + Z) = \boxed{0} \quad \checkmark$$

4.  $\rho(W, V) =$ 

☐  $\frac{b}{\sqrt{b^2 + c^2}}$

☐  $\frac{b^2}{\sqrt{b^2 + 2c^2}}$

**Lec. 12: Sums of independent r.v.'s; Covariance and correlation**

Exercises 12 due Mar 30, 2016 at 23:59 UTC

**Lec. 13: Conditional expectation and variance revisited; Sum of a random number of independent r.v.'s**

Exercises 13 due Mar 30, 2016 at 23:59 UTC

**Solved problems**

**Additional theoretical material**

**Problem Set 6**

Problem Set 6 due Mar 30, 2016 at 23:59 UTC

**Unit summary**

☐ 
$$\frac{bd}{\sqrt{b^2+2c^2}}$$

☒ 
$$\frac{b}{\sqrt{b^2+2c^2}}$$
 ✓

*You have used 1 of 2 submissions*

## DISCUSSION

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