Homework 3 (Graded)

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ASV exercises 2.52, 3.40 (give both a pmf and a pdf), 3.49 (we'll cover this part of chapter 3 on Wednesday).

S3.1: Prove that $A \perp B \Leftrightarrow A \perp B^C \Leftrightarrow A^C \perp B \Leftrightarrow A^C \perp B^C$ (pretend the "perpendicular" symbol has another vertical line, so that it means "independent"). Use the law of total probability and the complement rule. Use the "circular implication" proof we started in class to save yourself time.

S3.2: Develop a single counterexample that disproves, for every $k \in \mathbb{N}$, the statement "$A_1, \ldots, A_k$ are mutually independent if $P(A_1 \cap \cdots \cap A_k) = P(A_1) \cdots P(A_k)$." Example 2.24 works for k = 3, but you will need something more systematic.

S3.3: Prove that mutual independence of k events implies pairwise independence for all possible pairs of those k events. **UPDATE: for this problem, use a weaker definition of mutual independence that is still valid. Instead of Fact 2.23 from ASV, use what I wrote on the board in class:** $A_1, \ldots, A_n$ are mutually independent if $P(A_1^* \cdots A_n^*) = P(A_1^*) \cdots P(A_n^*)$. Be careful in your notation; if you need to establish a pattern, make sure it is clearly explained or shown. We do not expect the "perfect proof," but we do expect it to be clear and relatively short. (Note: a similar but more general proof leads to Fact 2.23.)

Points 13

Submitting on paper

Due	For	Available from	Until
-	Everyone	-	-

+ Rubric