

Exercise 13.7.14

Introduction to Discrete Mathematics MATH 2001

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ABSTRACT. This is Exercise 13.7.14 from Apostol [Apo69, §13.7]:

Exercise 13.7.14. Let A and B denote events. Show that

$$P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$$

Solution. Since $A \cap B \subseteq A$, we have from [Apo69, Theorem 13.2(c)] that $P(A \cap B) \leq P(A)$. Again, since $A \subseteq A \cup B$, we have from [Apo69, Theorem 13.2(c)] that $P(A) \leq P(A \cup B)$. Finally, from [Apo69, Theorem 13.2(a)] we have that $P(A \cup B) \leq P(A) + P(B)$. \square

REFERENCES

- [Apo69] Tom M. Apostol, *Calculus. Vol. II: Multi-variable calculus and linear algebra, with applications to differential equations and probability*, Second edition, Blaisdell Publishing Co. Ginn and Co., Waltham, Mass.-Toronto, Ont.-London, 1969. MR 0248290

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