MATH 10B with Prof. Stankova | Student:
Section #209 ; time: 3:30-5pm | SID:
GSI: Ninh DO | **Quiz 8 Solution** | Tue 3/19/19

True/False - No explanation needed. (1pt for correct, 0pt - no answer, -1pt - incorrect)

1. A random variable has the expected value 0, maximum value 10 and minimum value -10. Its variance is 20. Is it possible? Yes/No
   True/Yes. The variance has different dimension from the RV (Var has dimension of X^2), so it can be larger than maximum value.

2. When we translate the random variable X by 2 units, i.e. X becomes $X+2$, the expected value is translated by 2 and the variance is translated by 4, i.e. $E[X]$ becomes $E[X]+2$ and $Var(X)$ becomes $Var(X)+4$, respectively. True/False
   False. E translated by 2, Var remains the same.

Problems - Need justification. No justification means **zero**!

1. (10pts) Let X_1 and X_2 denote the numbers that come up on two rolls of a fair four-sided die. Let $X = X_2$, $Y = X_1 + X_2$
   a) Find the expectation and variance of Y.
   b) Find $Cov(X, Y)$.

   a) $E(X_1) = E(X_2) = \frac{1}{4} * 1 + \frac{1}{4} * 2 + \frac{1}{4} * 3 + \frac{1}{4} * 4 = \frac{5}{2}$, where 1/4 is the probability of each number in one roll.
   $E(Y) = E(X_1) + E(X_2) = 5$

   $Var(X_1) = Var(X_2) = E(X_1^2) - E^2(X_1)$
   $E(X_1^2) = \frac{1}{4} * 1^2 + \frac{1}{4} * 2^2 + \frac{1}{4} * 3^2 + \frac{1}{4} * 4^2 = \frac{15}{2}$
   So, $Var(X_1) = Var(X_2) = \frac{15}{2} - \frac{5^2}{2^2} = \frac{5}{4}$
   $Var(Y) = Var(X_1) + Var(X_2) = \frac{5}{2}$ since X_1 and X_2 are independent

   b) $Cov(X, Y) = Cov(X_2, X_1 + X_2) = Cov(X_2, X_1) + Cov(X_2, X_2) = 0 + Var(X_2) = \frac{5}{4}$. Since X_1 and X_2 are independent, their covariance is 0.