1. Consider two independent random variables $X$ and $Y$ that are each uniformly distributed on the interval $[0, 10]$.

Find $P(|X - Y| < 1)$, i.e., find the probability that $X$ and $Y$ are less than 1 unit apart. Hint: Think about the $10 \times 10$ grid where $(X, Y)$ is located. What is the area of the region where $|X - Y| < 1$?

2. Suppose that the grades of two students are independent and each are uniformly distributed in the interval $[90, 100]$. Find the probability that the sum of the two grades is 197 or higher.

3. Suppose that $U$ is uniformly distributed on the interval $[0, 5]$.

3a. What is the CDF of $U$?

3b. Now define $X = 3U + 2$. What is the CDF of $X$?

3c. What kind of distribution does $X$ have?

4. Let $U$ and $V$ be independent and uniformly distributed on the interval $[0, 3]$.

Let $X = \max(U, V)$. Let $Y = \min(U, V)$.

4a. What is the CDF of $X$?

4b. What is the probability density function of $X$?

4c. What is the CDF of $Y$?

4d. What is the probability density function of $Y$?