# Math 130B - Variance and Covariance

1. If $X$ and $Y$ are independent and identically distributed with mean $\mu$ and variance $\sigma^2$, find

$$E[(X-Y)^2].$$

2. A die is rolled twice. Let $X$ equal the sum of the outcomes and let $Y$ equal the first outcome minus the second. Compute $\mathrm{Cov}(X,Y)$.

3. The random variables $X$ and $Y$ have a joint density function given by

$$f(x,y) = \begin{cases} 2e^{-2x}/x, & 0 \le x < \infty,\ 0 \le y \le x \\ 0, & \text{otherwise.} \end{cases}$$

Compute $\mathrm{Cov}(X,Y)$.

4. Show that $E[(X-a)^2]$ is minimized at $a = E[X]$.