1. Let A and B be events and let Y be a random variable uniformly distributed on $(0, 1)$. Suppose that, conditional on $Y = p$, A and B are independent, each with probability p. Find:

   a) the conditional probability of A given that B occurs

   b) the conditional density of Y given that A occurs and B does not.
   Pitman 6.3.9

2. Let X_1 and X_2 be the numbers of two independent fair die rolls and let $X = X_1 - X_2$, $Y = X_1 + X_2$. Show that X and Y are uncorrelated but not independent.
   Pitman 6.4.6

3. Suppose X and Y are random variables where $Var(X) = 4$ $Var(Y) = 9$, and $Cov(X, Y) = 5$. Find:

   a) $Cov(X, X)$
   b) $Cov(X, X + Y)$
   c) $Cov(X - Y, X + 2Y)$
   d) $Var(2X + Y)$
   e) $Corr(X - Y, Y)$