

**Homework 9 - Math 421**

Name: \_\_\_\_\_

*Due Monday, November 6. Be sure to show any work you needed to do. You can use a calculator or computer, but give exact (not decimal) answers when possible.*

1. A fair coin is flipped twice. Let  $X$  be the number of Heads in the two tosses, and  $Y$  be the indicator r.v. for the tosses landing the same way.

(a) Find the joint PMF of  $X$  and  $Y$ .

(b) Describe the marginal PMFs of  $X$  and  $Y$ .

(c) Are  $X$  and  $Y$  independent?

(d) Find the conditional PMFs of  $Y$  given  $X = x$  and of  $X$  given  $Y = y$ .

2. James Bond is trapped in a room with a bomb. The bomb will explode when a certain radioactive trigger decays. The time until the trigger decays has an exponential distribution with parameter  $\lambda = 2$  per hour. James Bond must pick a lock to escape the room. Suppose the time it takes him to pick the lock is also exponentially distributed with parameter  $\lambda = 3$  per hour. What is the probability that James Bond will escape with less than 10 minutes to spare before the bomb explodes?

(a) Write a double integral for the probability.

(b) Second, calculate the double integral.