Name:

MATH 321: Review Part 1

1. Let (X, Y) be a bivariate continuous random vector with joint pdf $f(x, y) = 3x \quad$ for $0 \leq y \leq x \leq 1$.

   (a) Find $P(X \geq 0.5, Y \geq 0.5)$.

   (b) Show if $X \perp\!\!\!\perp Y$ using the definition.

   (c) Find the conditional pdfs $f(x \mid y)$ and $f(y \mid x)$.

   (d) Using result from (c), find $E(X \mid Y = 0.5)$.

2. Let (X, Y) be a bivariate continuous random vector with joint pdf
$f(x, y) = 4xy \quad$ for $0 \leq x \leq 1, 0 \leq y \leq 1$.

(a) Find $P(Y \geq X)$.

(b) Show if $X \perp\!\!\!\perp Y$ by inspection.

(c) Using result from (b), find $E(X^4 Y)$

3. Let (X, Y) be a bivariate discrete random vector with joint pmf table:

y \ x	0	1
0	2/9	3/9
1	2/9	1/9
2	1/9	0

(a) Find the following probabilities: $P(X \leq 1, Y = 0)$, $P(X + 1 \leq Y)$, and $P(Y^2 = X)$.

(b) Find the marginal pmfs of X and Y. Also find the conditional pmfs of $f(x \mid Y = 0)$ and $f(x \mid Y = 1)$.

(c) Find the following: $E(X \mid Y = 1)$, and $E(X + 1 \mid Y = 0)$.

(d) Find $\text{Cov}(X, Y)$.

(e) Find $\text{Corr}(X, Y)$.

(f) Find $V(X + Y)$.