Please write ***Your name:*** ______________________________

Show all work. You should either write at a sentence explaining your reasoning, or annotate your math work with brief explanations. There is no need to simplify, and no calculators are needed.

Solving 5 out of 6 problems will give you 10 points in this quiz.

Suppose the joint density function of the random variables X and Y is

$$f(x,y) = \begin{cases} x+y & 0<x<1,\ 0<y<1 \\ 0 & \text{otherwise.} \end{cases}$$

(1) Find the covariance $\mathrm{Cov}(X,Y)$. Do not simplify your answer.

(more questions on the next page)

(2) In the situation form the previous page, find the correlation coefficient $\rho(X, Y)$.
Do not simplify your answer.

(more questions on the next page)

(3) In the situation form the previous page, find the conditional expectation $\mathbb{E}(X|Y)$.
Do not simplify your answer.

(more questions on the next page)

(4) If X, Y, Z are exponential random variables with $\lambda = 2$, use moment generating functions to find $\mathbb{E}(X + Y + Z)^2$

(more questions on the next page)

(5) If we rolls two dice, and X is the sum, can you write a formula for its moment generating function $m_X(t)$? Hint: your formula may be long, but you do not need to simplify it.

(more questions on the next page)

(6) Find the moment generating function $m_X(t)$ for a random variable X with the p.d.f.

$$f_X(x) = \begin{cases} \dfrac{1}{9} & \text{if } \ 2 < x < 5 \\ \dfrac{2}{9} & \text{if } \ 5 < x < 8 \\ 0 & \text{otherwise} \end{cases}$$

(End of the quiz)