Time: 20 mins

Name: Std. Number:

Quiz 1 (Review of Probability and Signals)

Questions

1. A pair of jointly continuous random variables, X and Y , have a joint probability density function given by

$$f_{X,Y}(x,y) = \begin{cases} c, & in\ the\ shaded\ region\ of\ Figure.\ 1 \\ 0, & Otherwise. \end{cases}$$

   (a) (5 points) Find c.

   (b) (5 points) Find the marginal PDFs of X and Y, i.e., $f_X(x)$ and $f_Y(y)$.

   (c) (5 points) find $E[X|Y = 1/4]$ and $Var[X|Y = 1/4]$, that is, the conditional mean and conditional variance of X given Y=1/4

   (d) (5 points) Find the conditional PDF for X given that $Y = 3/4$, i.e., $f_{X|Y}(x|3/4)$.

2. Are all memoryless systems causal? If the answer is no, give a counterexample.

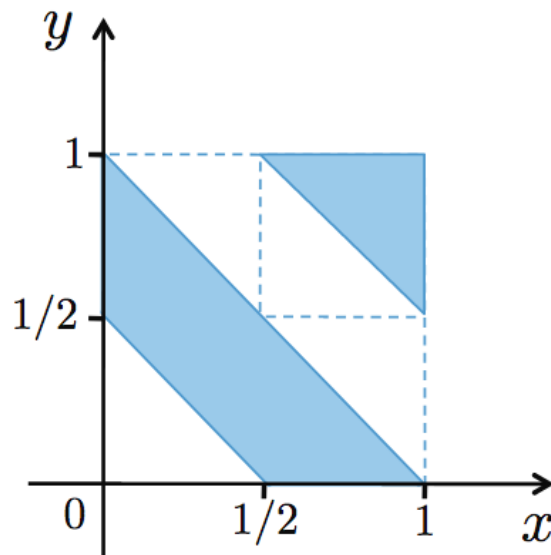3. Are all causal systems memoryless? If the answer is no, give a counterexample.

Figure 1