

Name _____

Student Number _____

STA107H5S Quiz 4B

Consider the random variable x and y with joint probability mass function:

X/Y	-1	0	1	2
0	0.05	0.15	0.1	0.2
1	0.15	0.1	0	0.25

1. (2 marks) Is X and Y independent? Note the rows in the pdf are the values of X and the columns the values of Y .

$P(X=1, Y=1) = 0 \neq P(X=1)P(Y=1)$ So not independent

2. (2 marks) *True or False:* $P(X=a \mid Y=b) \geq P(X=a)$. For any random variables X and Y and any constants a and b . Explain your reasoning or you get zero points.

False: $P(X=a \mid Y=b) = 0 \iff (X=a), (Y=b)$ mutually exclusive or could = 1 if $(Y=b) \subseteq (X=a)$ so cannot say either way...

3. (3 marks) Consider a different unspecified joint density function for random variables X and Y . If $P(X=1 \mid Y=2) = 0.2$ and $P(Y=2 \mid X=1) = 0.05$ and $P(X=1) = 0.2$. Find $P(Y=2)$

$P(Y=2) = 0.05$

4. (3 marks) consider the random variable X with $E(X) = \mu$ and $\text{Var}(x) = \sigma^2$. Express $E[X^2 - \sigma^2]$ in terms of μ and σ^2
- μ^2