1. You are given two random variables $X$ and $Y$ with a joint pmf described by

$$p_{X,Y}(x,y) = \begin{cases} \frac{1}{8}, & \text{if } (x,y) = (0,0) \\ \frac{1}{6}, & \text{if } (x,y) = (1,1), (1,2), (2,2) \\ 0, & \text{otherwise} \end{cases}$$

$E[X] =$ 

$E[Y] =$

What is the correlation of $X$ and $Y$?

Are $X$ and $Y$ independent?

$E[Y|X = 1] =$

What is the correlation coefficient between $X$ and $Y$?

Given that for two Gaussian random variables $U$ and $V$, $m_{V|u} = m_V + \rho \frac{\sigma_V}{\sigma_U} (u - m_u)$, what is the best affine estimator, $\hat{Y}[X]$, for $Y$ in the minimum mean squared error (MMSE) sense?

Without restriction, what is the best estimator, $\hat{Y}[X]$, for $Y$ in the minimum mean squared error (MMSE) sense?