

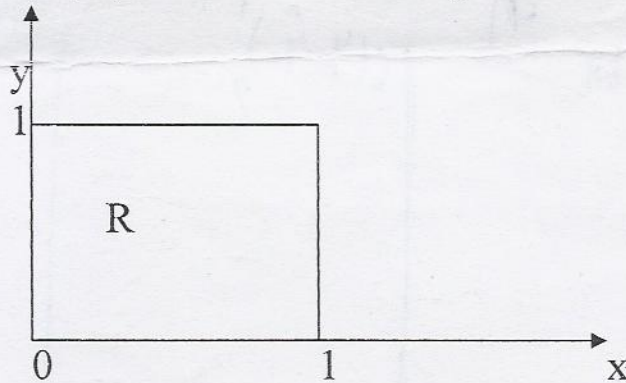
Q1. If $Y = aX + b$, determine r_{XY} .

Q2. Given $Y = X^3$, $f_X(x)$ uniform in $(-1, 1)$, determine linear MMSE of Y in terms of X . Determine also the non-linear estimate. How would the linear estimate change if $f_X(x) = |x|$ in $(-1, 1)$. Comment on the change.

Q3. Show that

$$E[Y/X \leq 0] = 1/F_X(0) \left\{ \int_{-\infty}^0 E[Y|x] f_X(x) dx \right.$$

Q4. A random point (X, Y) is uniform in the square shown below.



Determine linear MMSE of $Z = XY$, and the error in the estimate.

Q5. Show that if $\{a_n\} \rightarrow a$ and if $E[(X_n - a_n)^2] \rightarrow 0$, then $\{X_n\} \rightarrow a$ as $n \rightarrow \infty$ in the m.s. sense.

Can you create an illustrative example?

Q6. If $Z = X + Y$, where X and Y are independent, and X is uniform in $(-10, 10)$ and Y is uniform in $(0, 1)$, determine MMSE estimates of Z in terms of X