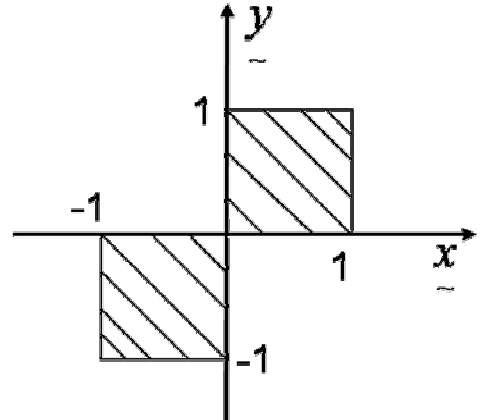


**EE 503**  
**Homework #2**  
**(Due : Dec. 7, 2012)**

**Problem 1**

The random variables  $\tilde{x}$  and  $\tilde{y}$  are distributed *uniformly* in the shaded region shown.



- a) Find the minimum mean square error estimator for the estimation of  $\tilde{y}$  given  $\tilde{x} = x$ . Evaluate the mean square error of the estimator.
- b) Find the *linear* minimum mean square error estimator for the estimation of  $\tilde{y}$  given  $\tilde{x} = x$ . That is, find  $w_0$  in the parametric estimator  $\hat{y} = w_0 x$ . Evaluate the mean square error of the estimator.

**Matlab Experiment:**

1. Generate  $x$  and  $y$  with the described pdf. You can do the following  
`>> x=10;y=-10; while (x*y<0), x=2*rand(1)-1;y=2*rand(1)-1; end;`
2. Make a two dimensional histogram of  $x$  and  $y$ 's generated in Step 1. Verify that the shape of the histogram matches the desired pdf.
3. Implement the estimators designed in parts a) and b).
4. Generate a large number of  $x$  and  $y$ 's and calculate the estimation error on  $y$  for every  $(x,y)$  pair. Make a histogram of the estimation error.
5. Calculate the mean and variance of the histogram Does the variance found by the experiment match the theory?

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**Problem 2**

Repeat Problem 1 for the distribution uniformly distributed in the shaded region shown.

