Stat 331, Solutions to Homework 5

6. The expectation is $E[T] = ab$.

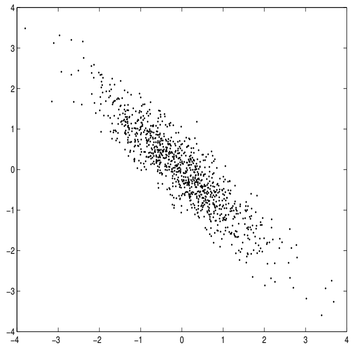
2a. If (X, Y) is bivariate normal with parameters $\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho$, then $X \sim N(\mu_1, \sigma_1^2)$ and the conditional distribution of Y given that $X = x$ is $N(\mu_2 + \rho\frac{\sigma_2}{\sigma_1}(x - \mu_1), \sigma_2^2(1 - \rho^2))$. To generate n observations on such a bivariate normal distribution in Matlab, do

$x = random('norm', \mu_1, \sigma_1, 1, n);$
$y = random('norm', \mu_2 + \rho * \sigma_2/\sigma_1 * (x - \mu_1), sqrt(\sigma_2^2 * (1 - \rho^2)), 1, n);$

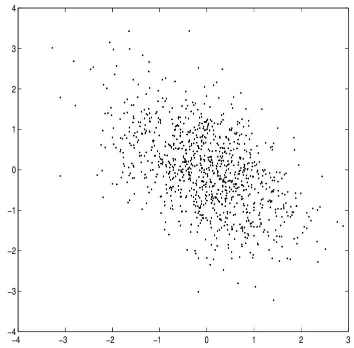
b. With these parameter values, the Matlab commands become
$x = random('norm', 0, 1, 1, 1000); y = random('norm', \rho * x, sqrt(1 - \rho * \rho));$

and the plots should look something like this:

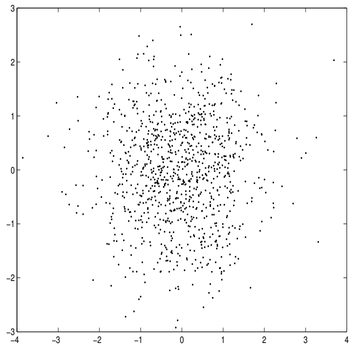
$\rho = -0.9$



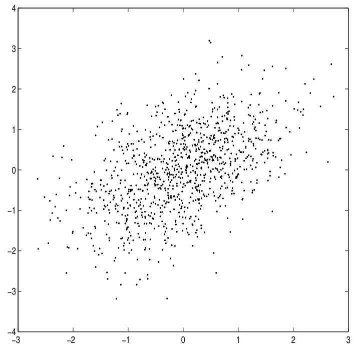
$\rho = -0.5$



$\rho = 0$



$\rho = 0.5$



$\rho = 0.9$