Solutions to PS # 2.0

```
%**************************************************************
%
%        This mfunction generates faded envelope and phase
%        corresponding to Rayleigh or Rician fading
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%        DATE  : 09/10/00
%        FUNCTION SYNOPSIS:
%        [env,phi] = fade(L,para,type)
%
%        Parameter Description:
%        L          :   number of samples needed
%        para       :   parameter vector containing
%                       [m1,m2,var]
%        type       :   string containing the type
%                       of fading with the options
%        'Rayleigh' : Rayleigh fading
%        'Rice'     : Rician fading
%**************************************************************
function [env,phi] = fade(L,para,type)
%  Error check
if strcmp(type,'Rayleigh') == 1
   if para(1) ~= 0 & para(2) ~= 0
error('Fade type and means do not match')
   end
   mu = zeros(1,2);
elseif para(3) <= 0
   error('Positive variance needed')
elseif size(para) ~= 3
   error('Insufficient input parameters')
elseif strcmp(type,'Rayleigh') == 0 & strcmp(type,'Rice') == 0
   error('Invalid Option Type')
end
%  Generate bivariate Gaussian uncorrelated
%  random variables
mu = [para(1) ; para(2)];
C = para(3)*eye(2,2);
r = mvnrnd(mu,C,L);
%  Convert to polar coordinates and compute
%  magnitude and phase
z = r(:,1) + j*r(:,2);
env = abs(z); phi = angle(z);
%**************************************************************
```

Function Testing
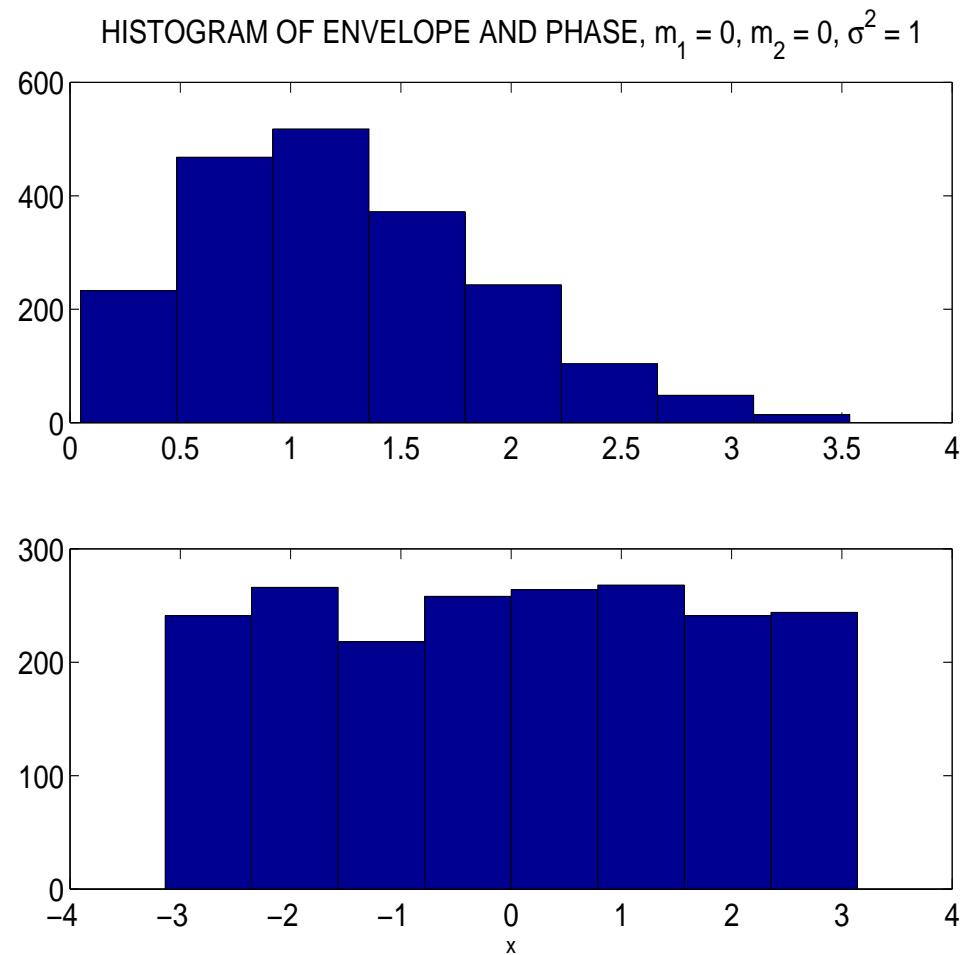
Figure 1: Rayleigh fading: $s = 0$, $K = 0$
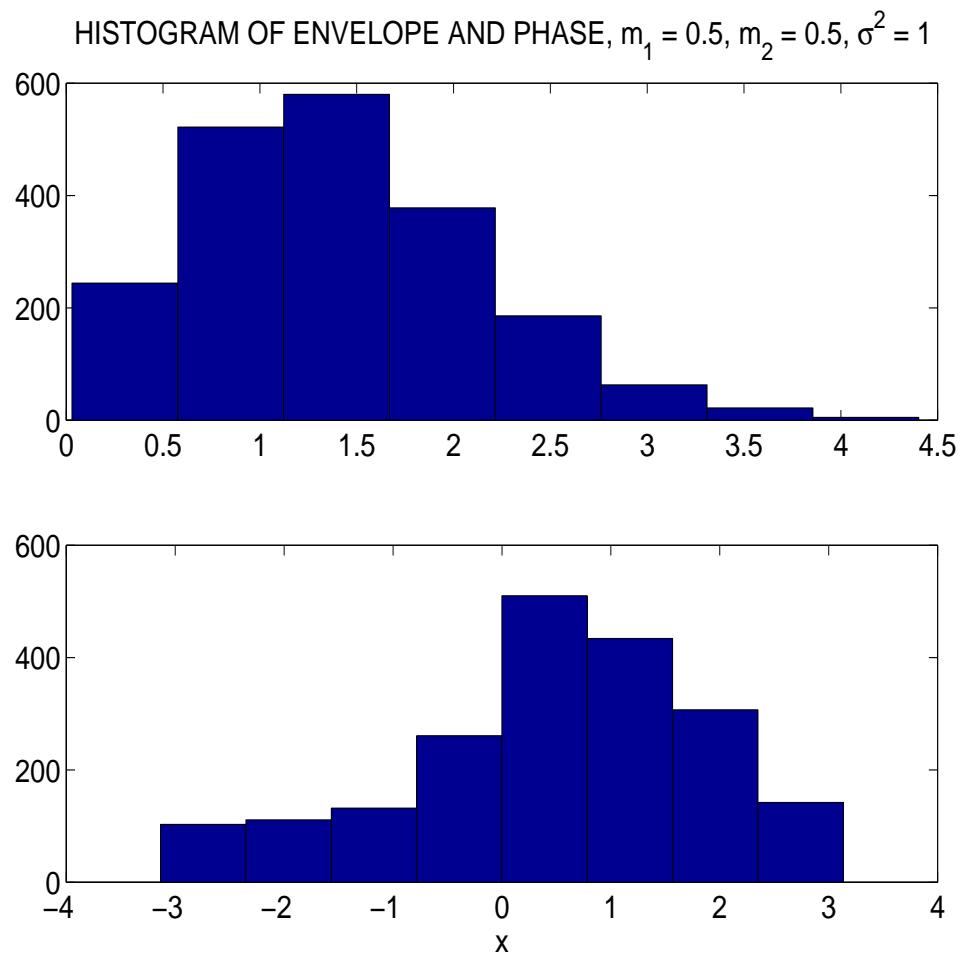
Figure 2: Rayleigh fading: $s = 0.7071$, $K = 0.25$

HISTOGRAM OF ENVELOPE AND PHASE, $m_1 = 1$, $m_2 = 2$, $\sigma^2 = 1$
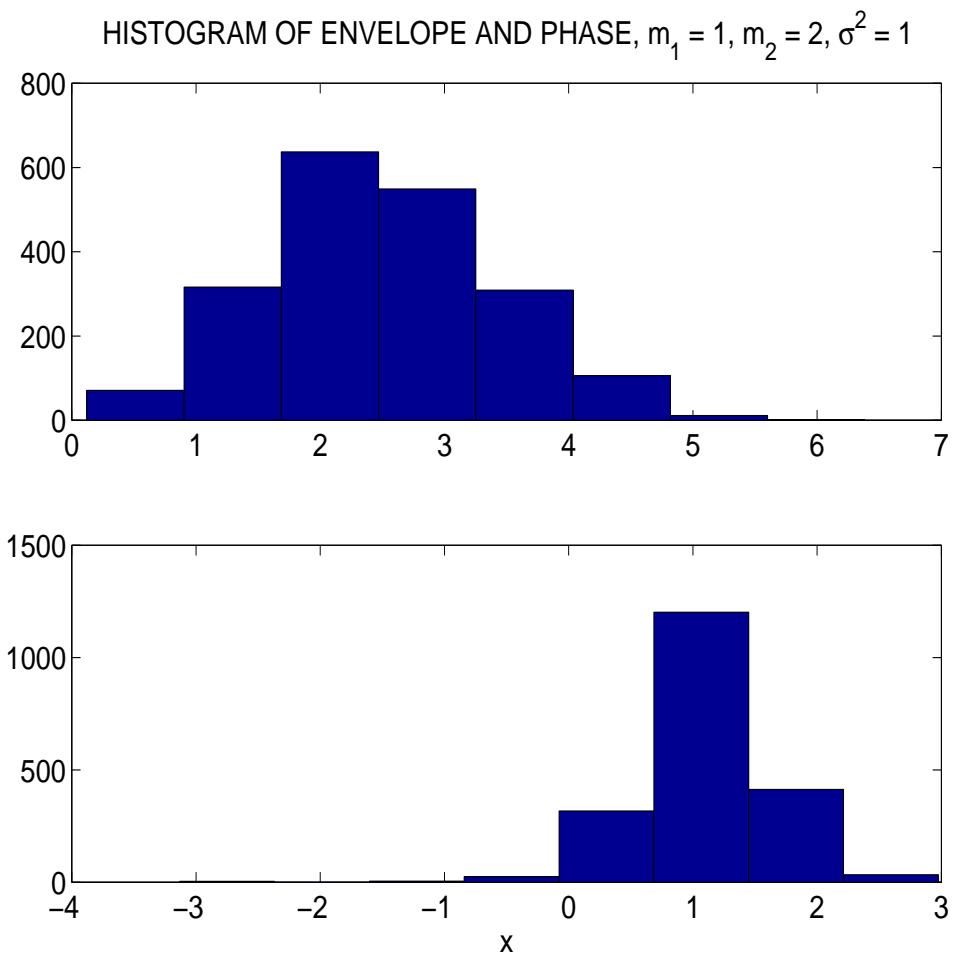
Figure 3: Rician fading: $s = 2.236$, $K = 2.5$