```
%                               EXPERIMENT-1 <<Part-A>>
% Write a program to plot PDF of a Gaussian (Normal) Random Variable for:
%       CASE-1 Standard Gaussian: mean = 0 and standard deviation = 1
%       CASE-2 General Gaussian: mean = 1 and standard deviation = 1
%       CASE-3 General Gaussian: mean = -1 and standard deviation = 1
%       CASE-4 General Gaussian: mean = 0 and standard deviation = 1.5
%       CASE-5 General Gaussian: mean = 0 and standard deviation = 0.5
%       CASE-6 General Gaussian: mean = 1 and standard deviation = 0.5

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% Plotting Cas-1:
  m = 0;        # Given: mean = 0
  sd = 1;       # Given: standard deviation = 1
  x = -6:0.1:6; # Define suitable range of x values (as per our choice).
  y = normpdf(x,m,sd); # Calculate values of Normal PDF for all xs.
# Note: The 'normpdf' function belongs to the statistics package.
#      To load the package,run 'pkg load statistics' from the Octave prompt
#       in command window before running this program.

  figure(1)   # Open a figure window named as figure-1.
# We wish to plot all the cases (Total 6 Plots) in the same figure window.
# Use 2 rows & 3 columns so that we have total 6 plots as shown below.
#          +-----+-----+-----+
#          |  1  |  2  |  3  |
#          +-----+-----+-----+
#          |  4  |  5  |  6  |
#          +-----+-----+-----+
  subplot(2,3,1)  # The plot (Case-1) will be on location-1 as shown above.
  plot(x,y)       # To plot Case-1 (y vs x).
  axis([-6 6 0 1]); # x-axis ranges from -6 to 6 & y-axis ranges from 0 to 1.
  title('CASE-1: mean=0, std dev=1') # Title of the plot
  xlabel('x values----->');
  ylabel('PDF--->');
  grid on;


% Plotting Case-2:
% Write the code yourself to plot Case-2 on Location-2 with given mean and
% standard deviation.
   m = 1;        # Given: mean = 1
  sd = 1;       # Given: standard deviation = 1
  x = -6:0.1:6; # Define suitable range of x values (as per our choice).
  y = normpdf(x,m,sd); # Calculate values of Normal PDF for all xs.
  figure(2)   # Open a figure window named as figure-1.
  subplot(2,3,1)  # The plot (Case-2) will be on location-1 as shown above.
  plot(x,y)       # To plot Case-2 (y vs x).
  axis([-6 6 0 1]); # x-axis ranges from -6 to 6 & y-axis ranges from 0 to 1.
  title('CASE-1: mean=1, std dev=1') # Title of the plot
  xlabel('x values----->');
```

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  ylabel('PDF--->');
  grid on;


% Plotting Case-3:
% Write the code yourself to plot Case-3 on Location-3 with given mean and
% standard deviation.
 m = -1;        # Given: mean = -1
  sd = 1;       # Given: standard deviation = 1
  x = -6:0.1:6; # Define suitable range of x values (as per our choice).
  y = normpdf(x,m,sd); # Calculate values of Normal PDF for all xs.
  figure(3)   # Open a figure window named as figure-1.
  subplot(2,3,1)  # The plot (Case-3) will be on location-1 as shown above.
  plot(x,y)       # To plot Case-3 (y vs x).
  axis([-6 6 0 1]); # x-axis ranges from -6 to 6 & y-axis ranges from 0 to 1.
  title('CASE-1: mean=-1, std dev=1') # Title of the plot
  xlabel('x values----->');
  ylabel('PDF--->');
  grid on;


% Plotting Case-4:
% Write the code yourself to plot Case-4 on Location-4 with given mean and
% standard deviation.
  m = 0;        # Given: mean = 0
  sd = 1.5;       # Given: standard deviation = 1.5
  x = -6:0.1:6; # Define suitable range of x values (as per our choice).
  y = normpdf(x,m,sd); # Calculate values of Normal PDF for all xs.
  figure(4)   # Open a figure window named as figure-1.
  subplot(2,3,1)  # The plot (Case-1) will be on location-1 as shown above.
  plot(x,y)       # To plot Case-4 (y vs x).
  axis([-6 6 0 1]); # x-axis ranges from -6 to 6 & y-axis ranges from 0 to 1.
  title('CASE-1: mean=0, std dev=1.5') # Title of the plot
  xlabel('x values----->');
  ylabel('PDF--->');
  grid on;


% Plotting Case-5:
% Write the code yourself to plot Case-5 on Location-5 with given mean and
% standard deviation.
   m = 0;        # Given: mean = 0
  sd = 0.5;       # Given: standard deviation = 0.5
  x = -6:0.1:6; # Define suitable range of x values (as per our choice).
  y = normpdf(x,m,sd); # Calculate values of Normal PDF for all xs.
  figure(5)   # Open a figure window named as figure-1.
  subplot(2,3,1)  # The plot (Case-1) will be on location-1 as shown above.
  plot(x,y)       # To plot Case-5 (y vs x).
  axis([-6 6 0 1]); # x-axis ranges from -6 to 6 & y-axis ranges from 0 to 1.
  title('CASE-1: mean=0, std dev=0.5') # Title of the plot
  xlabel('x values----->');
  ylabel('PDF--->');
```

```
  grid on;

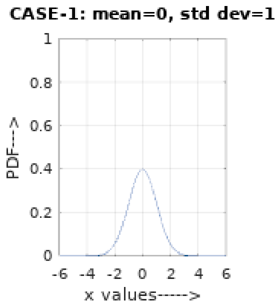
% Plotting Case-6:
% Write the code yourself to plot Case-6 on Location-6 with given mean and
% standard deviation.
   m = 1;        # Given: mean = 1
  sd = 0.5;       # Given: standard deviation = 0.5
  x = -6:0.1:6; # Define suitable range of x values (as per our choice).
  y = normpdf(x,m,sd); # Calculate values of Normal PDF for all xs.
  figure(6)   # Open a figure window named as figure-1.
  subplot(2,3,1)  # The plot (Case-6) will be on location-1 as shown above.
  plot(x,y)       # To plot Case-1 (y vs x).
  axis([-6 6 0 1]); # x-axis ranges from -6 to 6 & y-axis ranges from 0 to 1.
  title('CASE-1: mean=1, std dev=0.5') # Title of the plot
  xlabel('x values----->');
  ylabel('PDF--->');
  grid on;

% Compare Case-1, 2 and 3: Observe the effect of mean in terms of Position,
%                          Width and Height.

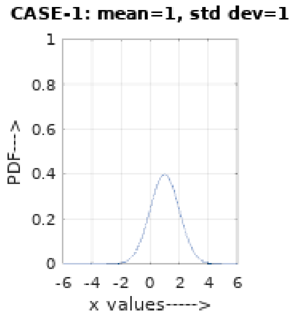
% Compare Case-1, 4 and 5: Observe the effect of standard deviation in terms of
%                          Position, Width and Height.

% Compare Case-1 and 6: Observe the effect of both mean and standard deviation
%                       in terms of Position, Width and Height.
```

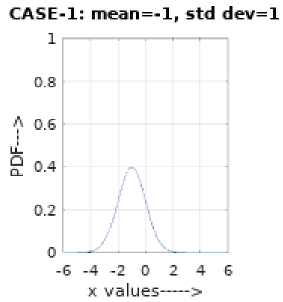
OUTPUT:



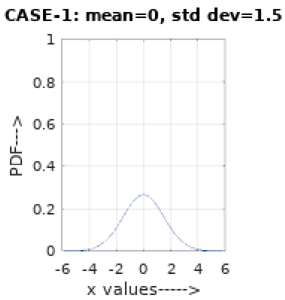
CASE-1: mean=0, std dev=1
PDF--->
x values----->



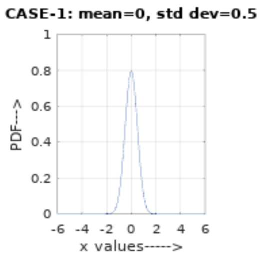
CASE-1: mean=1, std dev=1
PDF--->
x values----->



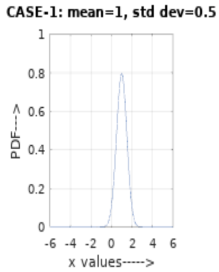
CASE-1: mean=-1, std dev=1
PDF--->
x values----->



CASE-1: mean=0, std dev=1.5
PDF--->
x values----->



CASE-1: mean=0, std dev=0.5
PDF--->
x values----->

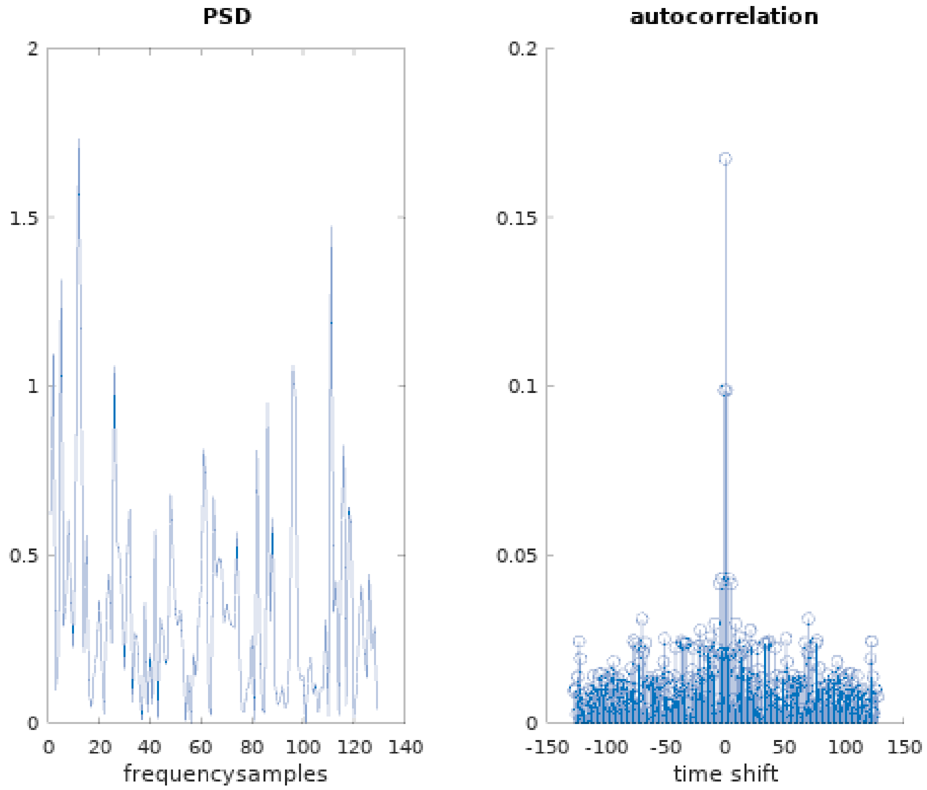


CASE-1: mean=1, std dev=0.5
PDF--->
x values----->

```
%                         EXPERIMENT-1 <<Part-B>>
% Write a Program to plot PSD and Autocorrelation of a White Gaussian Random
% Process

y=normrnd(0,1,1,200);
Gy=periodogram(y);
Ry=abs(ifft(Gy,256));
Ry=[Ry(130:256)' Ry(1:129)']
t=-127:1:128;
figure
subplot(1,2,1)
plot(Gy)
xlabel('frequencysamples');
title('PSD')
subplot(1,2,2)
stem(t,Ry)
xlabel('time shift')
title('autocorrelation')
```

OUTPUT:



Conclusion :

Effect of mean and standard deviation in terms of the position, width and height of the graph was observed by comparing various cases . Autocorrelation of the white gaussian process was also plotted in octave software.

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Assignment 1

Q1 M.N & C are independent & identical Gaussian RV's with mean = 1 & variance = 1

$x(t) = Mt + C$

$Y(t) = Nt + C$

Find $R_{xy}(t_1, t_2)$ & $C_{xy}(t_1, t_2)$

→ $R_{xy}(t_1, t_2) = E[x(t_1) \cdot Y(t_2)]$

$= E[(Mt_1 + C)(Nt_2 + C)]$

$= E[MNt_1t_2 + MCt_1 + NCt_2 + C^2]$

$= E(M)E(N)t_1t_2 + E(M)E(C)t_1 + E(N)E(C)t_2 + E(C)^2$

$= t_1t_2 + t_1 + t_2 + 2$

$\mu_x(t) = E(x(t)) = E(Mt + C)$

$= E(M)t + E(C)$

$= 1 + t$

$\mu_{xy}(t) = E(y(t))$

$= 1 + t$

$C_{xy}(t_1, t_2) = R_{xy}(t_1, t_2) - \mu_x(t_1) \cdot \mu_x(t_2)$

$= (2 + t_1 + t_2 + t_1t_2) - (1 + t_1)(1 + t_2)$

$= 1$