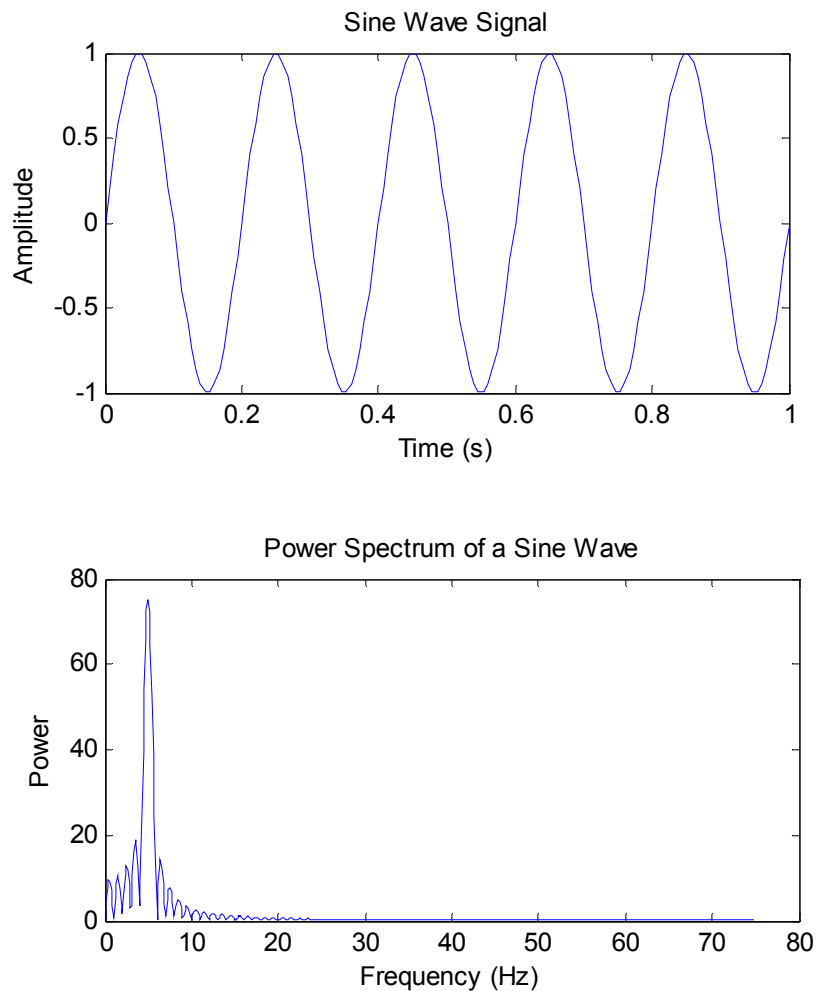
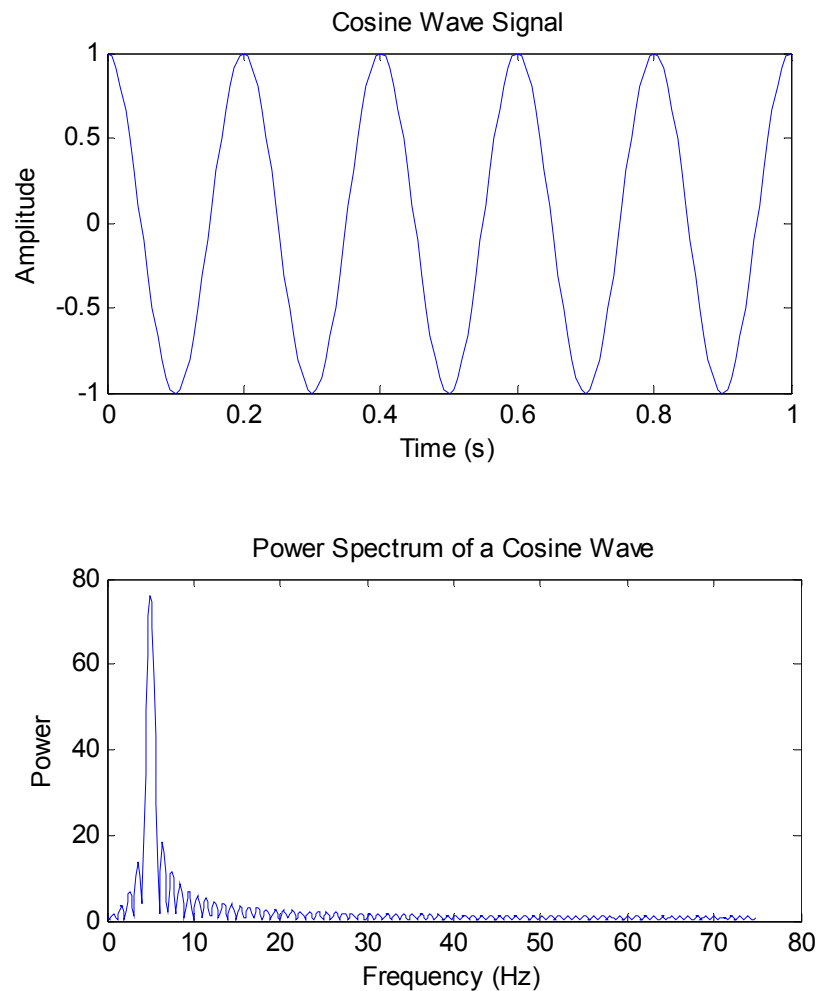


Example 1: Sine Wave



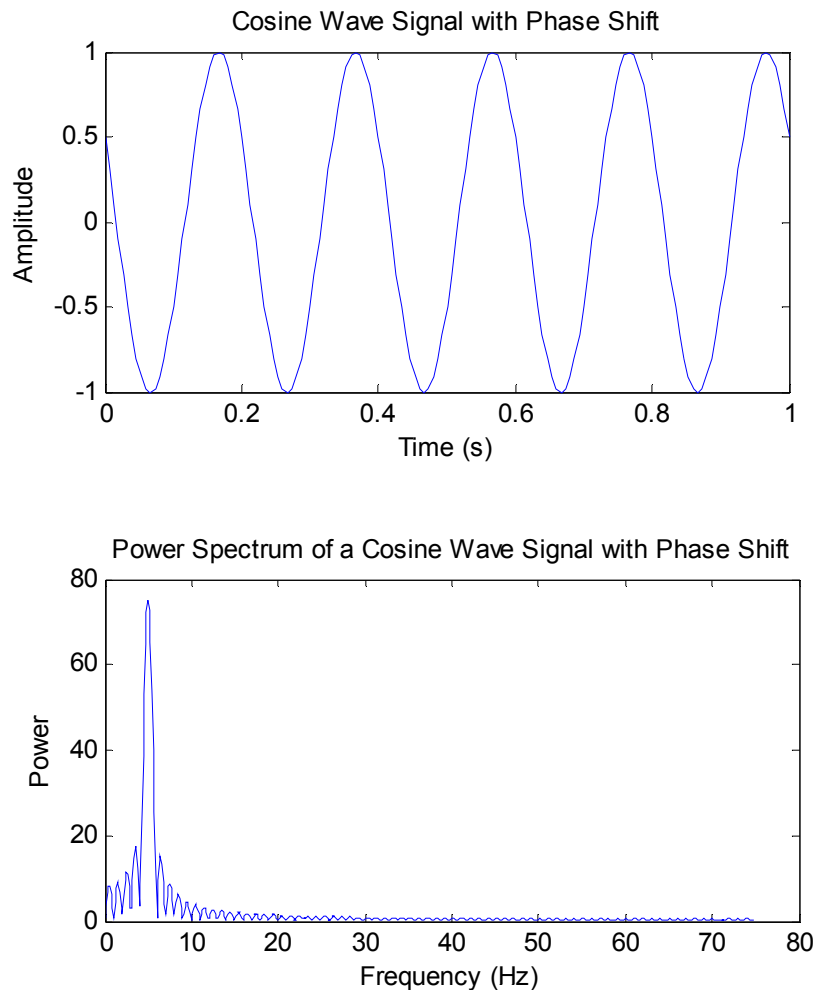
```
Fs = 150; % Sampling frequency
t = 0:1/Fs:1; % Time vector of 1 second
f = 5; % Create a sine wave of f Hz.
x = sin(2*pi*t*f);
nfft = 1024; % Length of FFT
% Take fft, padding with zeros so that length(X)
is equal to nfft
X = fft(x,nfft);
% FFT is symmetric, throw away second half
X = X(1:nfft/2);
% Take the magnitude of fft of x
mx = abs(X);
% Frequency vector
f = (0:nfft/2-1)*Fs/nfft;
% Generate the plot, title and labels.
figure(1);
plot(t,x);
title('Sine Wave Signal');
xlabel('Time (s)');
ylabel('Amplitude');
figure(2);
plot(f,mx);
title('Power Spectrum of a Sine Wave');
xlabel('Frequency (Hz)');
ylabel('Power');
```

Example 2: Cosine Wave



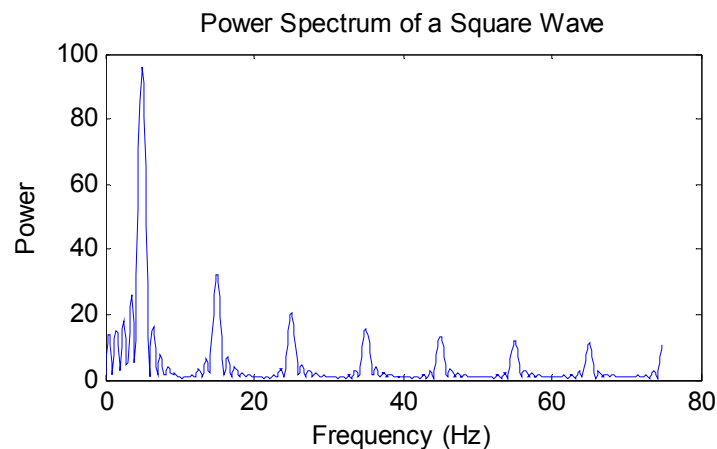
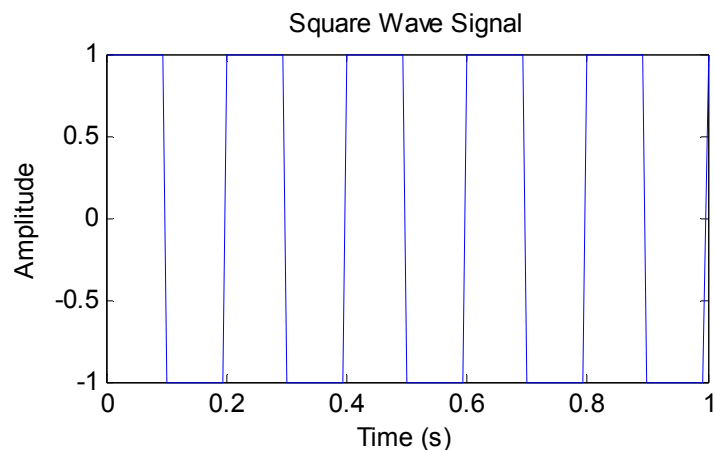
```
Fs = 150; % Sampling frequency
t = 0:1/Fs:1; % Time vector of 1 second
f = 5; % Create a sine wave of f Hz.
x = cos(2*pi*t*f);
nfft = 1024; % Length of FFT
% Take fft, padding with zeros so that length(X) is
equal to nfft
X = fft(x,nfft);
% FFT is symmetric, throw away second half
X = X(1:nfft/2);
% Take the magnitude of fft of x
mx = abs(X);
% Frequency vector
f = (0:nfft/2-1)*Fs/nfft;
% Generate the plot, title and labels.
figure(1);
plot(t,x);
title('Sine Wave Signal');
xlabel('Time (s)');
ylabel('Amplitude');
figure(2);
plot(f,mx);
title('Power Spectrum of a Sine Wave');
xlabel('Frequency (Hz)');
ylabel('Power');
```

Example 3: Cosine Wave with Phase Shift



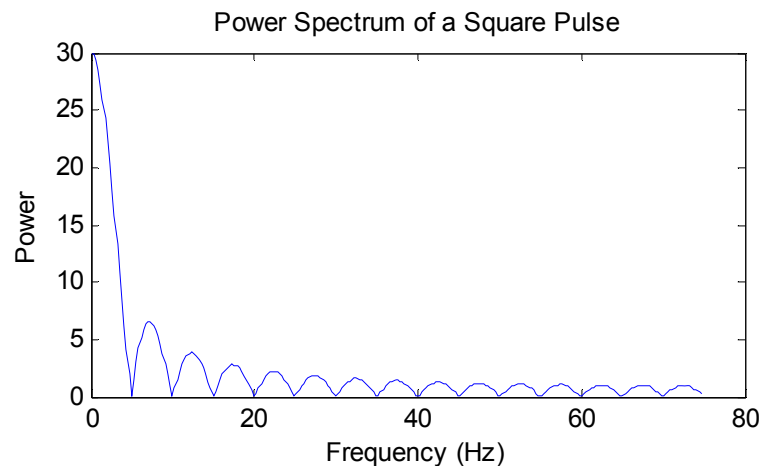
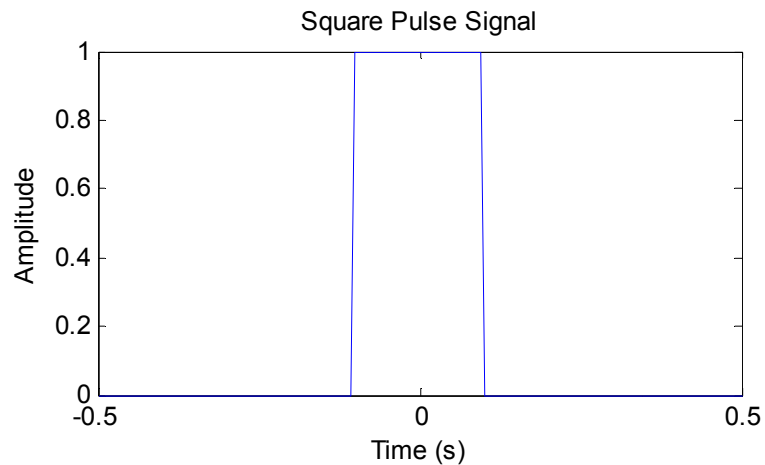
```
Fs = 150; % Sampling frequency
t = 0:1/Fs:1; % Time vector of 1 second
f = 5; % Create a sine wave of f Hz.
pha = 1/3*pi; % phase shift
x = cos(2*pi*t*f + pha);
nfft = 1024; % Length of FFT
% Take fft, padding with zeros so that length(X) is
equal to nfft
X = fft(x,nfft);
% FFT is symmetric, throw away second half
X = X(1:nfft/2);
% Take the magnitude of fft of x
mx = abs(X);
% Frequency vector
f = (0:nfft/2-1)*Fs/nfft;
% Generate the plot, title and labels.
figure(1);
plot(t,x);
title('Sine Wave Signal');
xlabel('Time (s)');
ylabel('Amplitude');
figure(2);
plot(f,mx);
title('Power Spectrum of a Sine Wave');
xlabel('Frequency (Hz)');
ylabel('Power');
```

Example 4: Square Wave



```
Fs = 150; % Sampling frequency
t = 0:1/Fs:1; % Time vector of 1 second
f = 5; % Create a sine wave of f Hz.
x = square(2*pi*t*f);
nfft = 1024; % Length of FFT
% Take fft, padding with zeros so that length(X) is
equal to nfft
X = fft(x,nfft);
% FFT is symmetric, throw away second half
X = X(1:nfft/2);
% Take the magnitude of fft of x
mx = abs(X);
% Frequency vector
f = (0:nfft/2-1)*Fs/nfft;
% Generate the plot, title and labels.
figure(1);
plot(t,x);
title('Square Wave Signal');
xlabel('Time (s)');
ylabel('Amplitude');
figure(2);
plot(f,mx);
title('Power Spectrum of a Square Wave');
xlabel('Frequency (Hz)');
ylabel('Power');
```

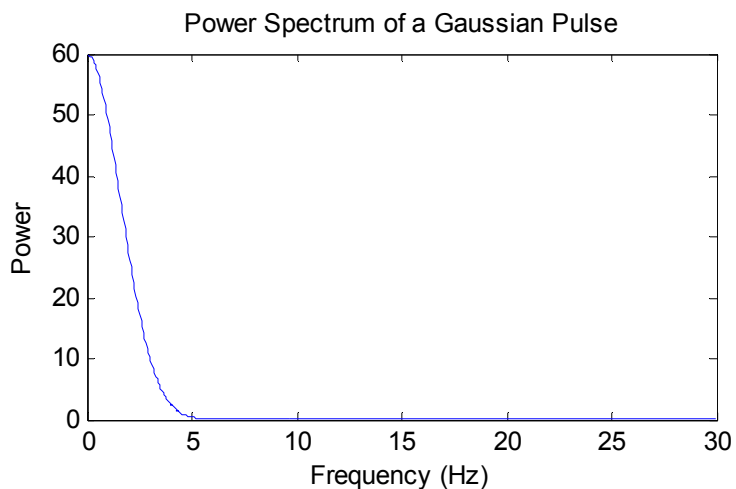
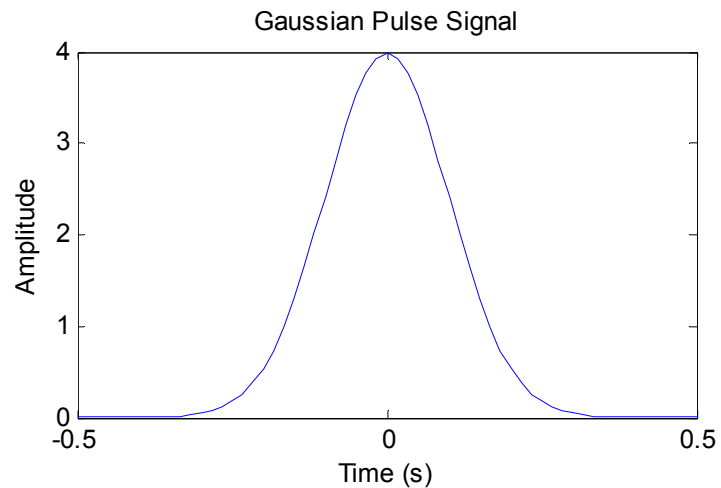
Example 5: Square Pulse



```

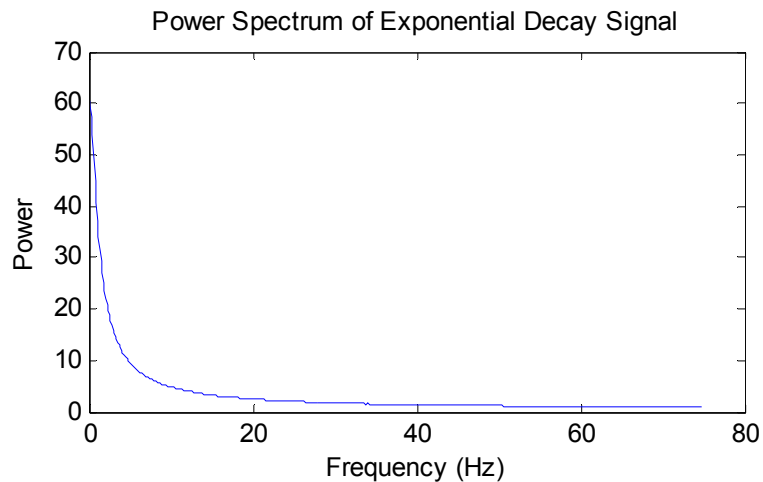
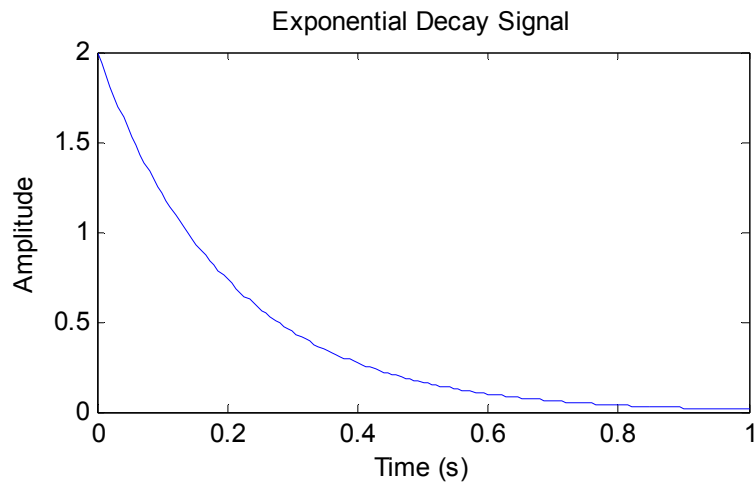
Fs = 150; % Sampling frequency
t = -0.5:1/Fs:0.5; % Time vector of 1 second
w = .2; % width of rectangle
x = rectpuls(t, w); % Generate Square Pulse
nfft = 512; % Length of FFT
% Take fft, padding with zeros so that length(X) is
equal to nfft
X = fft(x,nfft);
% FFT is symmetric, throw away second half
X = X(1:nfft/2);
% Take the magnitude of fft of x
mx = abs(X);
% Frequency vector
f = (0:nfft/2-1)*Fs/nfft;
% Generate the plot, title and labels.
figure(1);
plot(t,x);
title('Square Pulse Signal');
xlabel('Time (s)');
ylabel('Amplitude');
figure(2);
plot(f,mx);
title('Power Spectrum of a Square Pulse');
xlabel('Frequency (Hz)');
ylabel('Power');
    
```

Example 6: Gaussian Pulse



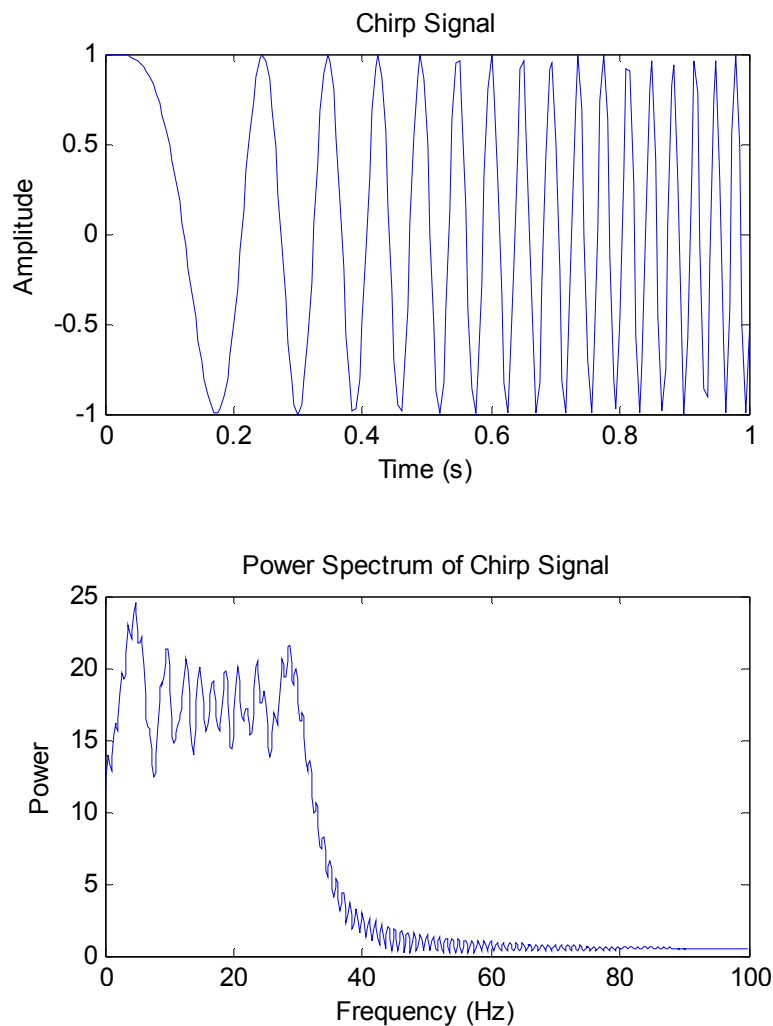
```
Fs = 60; % Sampling frequency
t = -.5:1/Fs:.5;
x = 1/(sqrt(2*pi*0.01))*(exp(-t.^2/(2*0.01)));
nfft = 1024; % Length of FFT
% Take fft, padding with zeros so that
length(X) is equal to nfft
X = fft(x,nfft);
% FFT is symmetric, throw away second half
X = X(1:nfft/2);
% Take the magnitude of fft of x
mx = abs(X);
% This is an evenly spaced frequency vector
f = (0:nfft/2-1)*Fs/nfft;
% Generate the plot, title and labels.
figure(1);
plot(t,x);
title('Gaussian Pulse Signal');
xlabel('Time (s)');
ylabel('Amplitude');
figure(2);
plot(f,mx);
title('Power Spectrum of a Gaussian Pulse');
xlabel('Frequency (Hz)');
ylabel('Power');
```

Example 7: Exponential Decay



```
Fs = 150; % Sampling frequency
t = 0:1/Fs:1; % Time vector of 1 second
x = 2*exp(-5*t);
nfft = 1024; % Length of FFT
% Take fft, padding with zeros so that
length(X) is equal to nfft
X = fft(x,nfft);
% FFT is symmetric, throw away second
half
X = X(1:nfft/2);
% Take the magnitude of fft of x
mx = abs(X);
% This is an evenly spaced frequency
vector
f = (0:nfft/2-1)*Fs/nfft;
% Generate the plot, title and labels.
figure(1);
plot(t,x);
title('Exponential Decay Signal');
xlabel('Time (s)');
ylabel('Amplitude');
figure(2);
plot(f,mx);
title('Power Spectrum of Exponential
Decay Signal');
xlabel('Frequency (Hz)');
ylabel('Power');
```

Example 8: Chirp Signal



```
Fs = 200; % Sampling frequency
t = 0:1/Fs:1; % Time vector of 1 second
x = chirp(t,0,1,Fs/6);
nfft = 1024; % Length of FFT
% Take fft, padding with zeros so that
length(X) is equal to nfft
X = fft(x,nfft);
% FFT is symmetric, throw away second half
X = X(1:nfft/2);
% Take the magnitude of fft of x
mx = abs(X);
% This is an evenly spaced frequency
vector
f = (0:nfft/2-1)*Fs/nfft;
% Generate the plot, title and labels.
figure(1);
plot(t,x);
title('Chirp Signal');
xlabel('Time (s)');
ylabel('Amplitude');
figure(2);
plot(f,mx);
title('Power Spectrum of Chirp Signal');
xlabel('Frequency (Hz)');
ylabel('Power');
```