% In-Lecture Assignment #2 on Feb. 13, 2019

% Write the MATLAB code for the following:

% (a) Generate a chirp signal $x[n] = 0.1 \cos(\omega_0 n + \pi (0.7 \text{x} 10^{-5}) n^2)$ where
% ω_0 is the discrete-time frequency corresponding to 220 Hz for n = 0, 1, …, 24000.

```
fs = 8000;          % Samples/s
n = 0 : 3*fs;       % There are fs samples in 1s
f0 = 220;           % A3 (A note at 220 Hz in third octave on Western scale)
w0 = 2*pi*f0/fs;
x = 0.1*cos(w0*n + pi*(0.7*10^(-5))*(n.^2));
```

% (b) Plot the spectrogram $x[n]$ with f_s = 8000 Hz.
% Spectrogram divides a long signal in smaller blocks for frequency analysis.
% The first block has blockSize samples starting at index zero. The Fourier transform
% is computed, and the magnitude of the Fourier transform is plotted in the first column.
% The second block has blockSize samples starting at index blockSize – overlap,
% and the magnitude of the Fourier transform is plotted in the second column, etc.

```
blockSize = 1024;
overlap = 512;        % 50% overlap of samples in adjacent blocks of samples
spectrogram(x, blockSize, overlap, blockSize, fs, 'yaxis');
```

% (c) Play the audio signal using f_s = 8000 Hz.

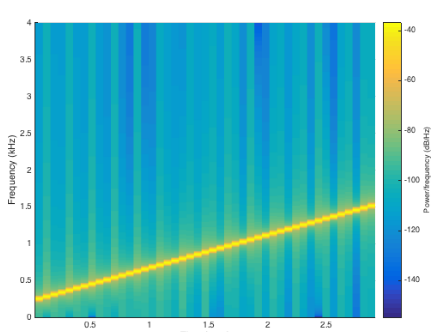
```
soundsc(x, fs);
```

% (d) Using MATLAB comments, describe what you hear.

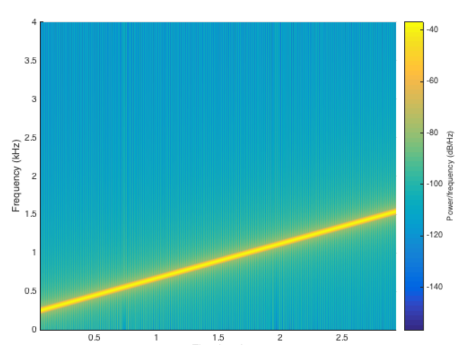
% Answers

% (b) The spectrogram shows that the principal frequency is
% increasing linearly with time from 220 Hz to about 1530 Hz.
% Plots are given at the bottom of the page.

% (c) The sound has a principal frequency that is increasing
% in frequency vs. time.



blockSize = 1024;
overlap = 512;
Rectangular window



blockSize = 1024;
overlap = 1023;
Rectangular window

Slides 14-20 of http://users.ece.utexas.edu/~bevans/courses/realtime/lectures/laboratory/c6748winDSK/lab1/CommonSignalsInMatlab.pptx