24.963 Linguistic Phonetics
Fall 2005

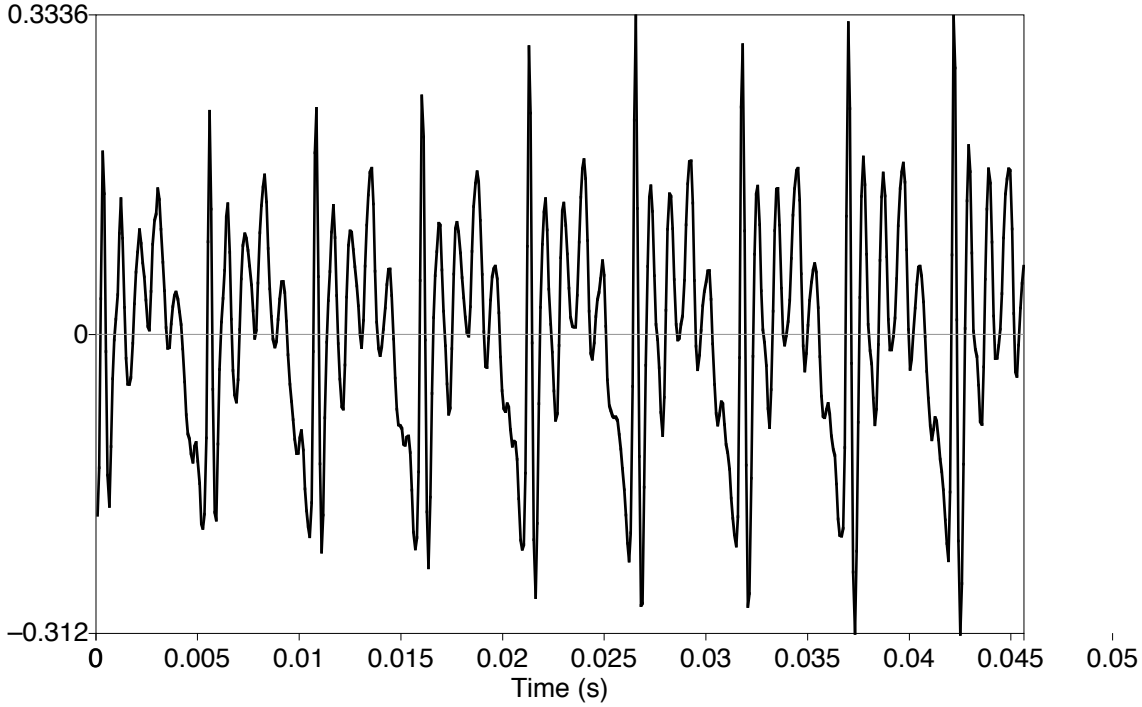
Assignment 1 – Basic Acoustics
due Fri 9/23

1. The figure at the bottom of the page shows a short section of the waveform of an utterance of the vowel [æ]. What is the fundamental frequency?

2. Draw (or print) the waveform of the complex wave produced by adding sine waves of 300 and 500 Hz (both with peak amplitude of 1). What is the fundamental frequency of this complex wave?

3. Telephones filter out frequencies below 400 Hz. For most speakers most of the time, fundamental frequency is below 400 Hz, so how can we hear pitch over the telephone?

4. Draw the spectrum of a complex periodic wave composed of 100 Hz and 700 Hz components (both with peak amplitude of 1).



5. What is the best signal-to-noise ratio (in dB) that we can get with a signal digitized with (a) 8 bit quantization, and (b) 16 bit quantization? That is - assume a maximum amplitude signal, and that the only source of noise is quantization noise (Johnson pp.26f.). NB give your answers in dB.