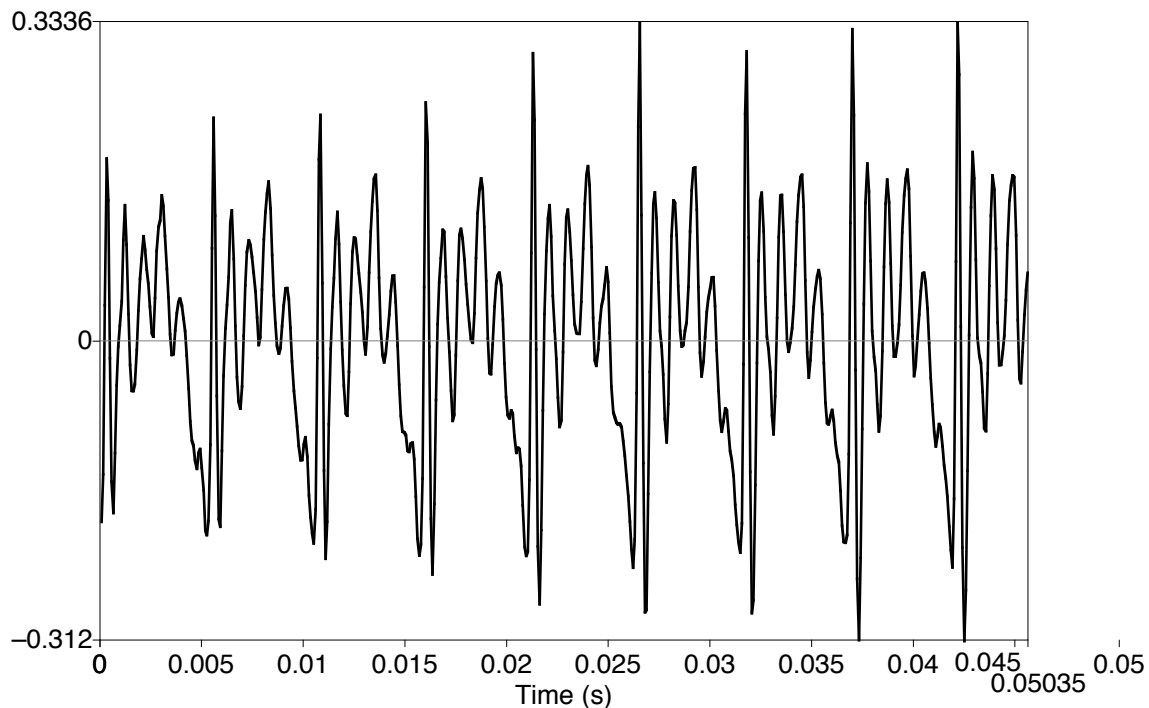**Assignment 1 – Basic Acoustics**
due Tues 9/22

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

2.   (a) 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?

     (b) Draw the spectrum of the complex wave in (a).

3. Standard analog 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?

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.57f.). Give your answers
     in dB.

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24.915 / 24.963 Quantum Optical Communication
Fall 2015

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