ASSIGNMENT 4

Due November 16, 2004, before 11:00 am

Problem 4

The Matlab demos directory contains several sound samples. One of them is a train whistle. The statement

```
load train
```

gives you a long vector y and a scalar Fs whose value is the number of samples per second. The time increment is 1/Fs seconds. If your computer has sound capabilities, the statement

```
sound(y,Fs)
```

plays the signal, but you don't need that for this problem. The data does not have a significant linear trend. There are two pulses of the whistle, but the harmonic content of both pulses is the same.

(a) Plot the data with time in seconds as the independent variable.

(b) Produce a periodogram with frequency in cycles/second as the independent variable.

(c) Identify the frequencies of the six peaks in the periodogram. You should find that ratios between these six frequencies are close to ratios between small integers. For example, one of the frequencies is 5/3 times another. The frequencies that are integer multiples of other frequencies are overtones. How many of the peaks are fundamental frequencies and how many are overtones?