October 26, 2004 – mini-Quiz #6 – 8.03

Your name . . . . . .

Mark your recitation: R01 – R02 – R03 – R04 – R05

In lectures, we discussed the following dispersion relation

$$\omega^2 = v^2k^2 + \alpha k^4$$

1. (4 pts) What is the medium for which this relationship is a fairly good approximation?

A string in musical instruments.

2. (4 pts) What is the origin of the term αk^4?

The stiffness of the string is responsible for this term.

The restoring force due to the tension is approximately proportional to k^2, the restoring force due to stiffness is approximately proportional to k^4. We chose a specific example, and calculated the effect this has on the tenth harmonic of a piano string whose fundamental is about 80 Hz.

3. (2 pts) What are the SI units of α?

αk^4 must have the same units as ω^2 which is sec^{-2}. Since k has units m^{-1}, α has units m^4/sec^2.