Midterm Exam - 2:00 PM Feb 24, 2025
Physics of Music– Phys 341
Time 50min

Do as many problems as you can in the time. After I have marked the exam, you will be given a chance to hand in revised answers to the questions you got wrong. Your midterm mark will be the average of the total marks obtained the first and second time. Note that the questions will be marked somewhat more strictly the second time, but you cannot get less than you got the first time.

The exam will be marked out of 20. There are 24 marks altogether on this exam. The marks for each question are given in square brackets at the beginning of the question. There are eight questions.

At the end of the questions and in the last graphs is some information which you may find useful.

Answer the questions in the Answer booklets, but if you do any work on the exam sheets, make sure you include them with the booklets.

There are five(5) pages altogether, two pages of exam questions and three of graphs.

Calculators (unprogrammed) are allowed in the exam room.

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1. [2] a) In figure 1 is the plot of a recording of a sound. What is the period of the sound? What is the frequency of the sound? What is the amplitude of the sound? What is the wavelength of the sound in air?

2. [3] Memorex had some advertisements in which they had Ella Fitzgerald sing and then showed a wine glass shattering. They then used a recording of her on Memorex tape and showed the same glass shattering. Discuss the plausibility of this advertisement? If one believes it, what aspect of the recording tape could this advertisement be highlighting?

   The frequency was about 700 Hz. and the decay time (time for the amplitude to fall in half) was about .5 sec. What was the Q of the glass?

3. [4] Briefly describe the basic components of the ear and their importance to the hearing of sound .

4. [4](a) One of the previous students said that they had a lamp on top of their piano which would vibrate and buzz when middle C was played, but not otherwise. Why is this happening? What can she do about to stop this behaviour of the lamp? (She needed it on the piano so she could see the music)

5. [4] You are standing in a canyon. You shoult and hear an echo 4 seconds later. What can you tell me about the width of the canyon?

   (b)What is the name of the note a (perfect) fourth above A_3? What is its frequency?

6. [3] A worker is subject to a sound of 80dB for 6 hours, and 100dB for two hour. What is the average intensity in watts/m^2 and in dB during the 8 hours? If the standards in that workplace required hearing protection if the average sound level during the day were above 90dB, would those workmen require hearing protection?

   [Remember that the standard for such dB ratings is that 0dB correspondes to 10^{-12} watts/m^2. Be careful in computing the average intensity, and recall that intensity is what is being averaged.]

7. [2] What happens to the frequency of the "popping sound" of a beer bottle as you gradually drink the beer? (Popping sound= sound produced as you pop your finger out of the opening of the bottle). What would happen to the pitch of the sound if you took the bottle into a Helium atmosphere (which has about $1/8^{th}$ the density of air).

8. [2] What will be the topic of your term paper for this course? Why?

$2^{1/12} = 1.0595$ $2^{2/12} = 1.122$ $2^{3/12} = 1.189$ $2^{4/12} = 1.2599$
$2^{5/12} = 1.3348$ $2^{6/12} = 1.414$ $2^{7/12} = 1.498$ $2^{8/12} = 1.587$
$2^{9/12} = 1.682$ $2^{10/12} = 1.782$ $2^{11/12} = 1.888$

Velocity of sound in air= 340 m/sec.

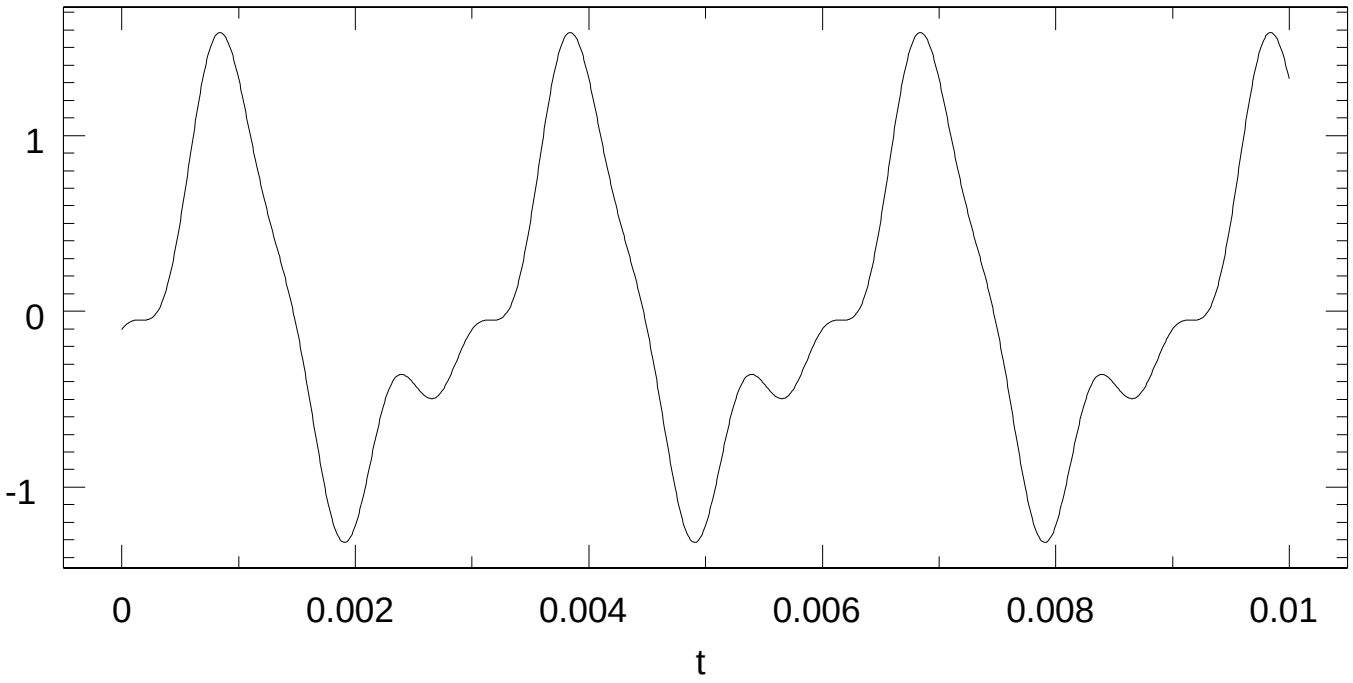
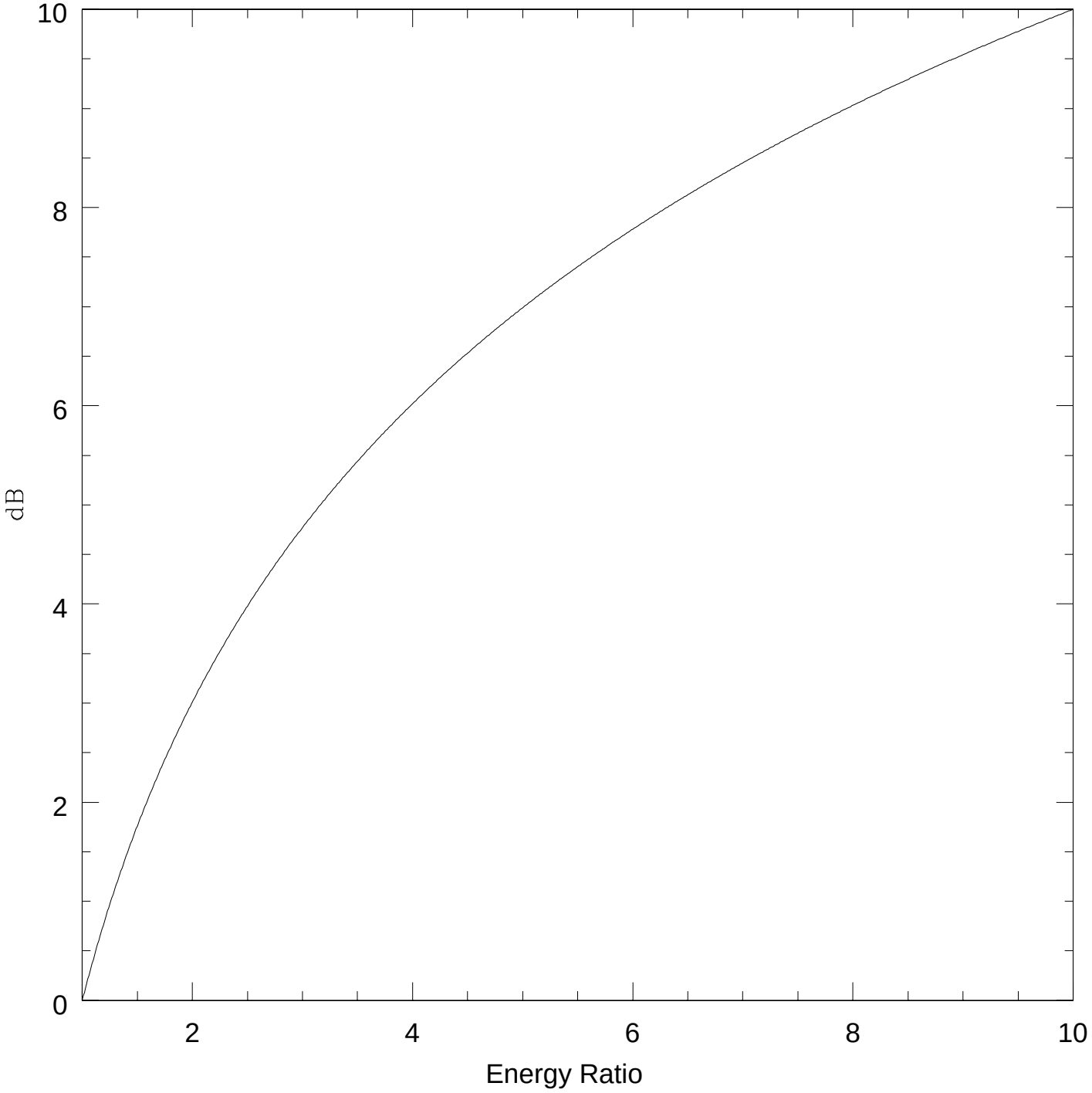


Figure 1


10
8
6
4
2
0
dB
2
4
6
8
10
Energy Ratio