

8. [8 points] Sound intensity, or loudness, as measured in decibels, decreases as you move further away from a sound source. If you move from a distance of a meters away from a certain sound source to a new distance of b meters away from it, then the sound intensity changes by

$$20 \log \left(\frac{a}{b} \right) \text{ decibels.}$$

- a. [3 points] Suppose a certain sound source has an intensity of 97 decibels when you stand 9 meters away from it. How far away from the sound source do you need to stand in order to reduce its sound intensity to 90 decibels? *Show all your work, and give your answer in exact form.*

Answer: _____ meters

- b. [3 points] Write a sentence that gives a practical interpretation, in the context of sound intensity, of the following statement:

$$\text{for any positive number } d, \quad 20 \log \left(\frac{d}{10d} \right) = -20.$$

Your sentence should *not* include the variable d .

- c. [2 points] Suppose the sound intensity S in decibels at a game in the Big House is given as a function of crowd attendance by $S = f(p)$, where p is the number of fans in attendance.

Complete the sentence below to give a practical interpretation of the equation

$$f'(90,000) = 10^{-4}.$$

When there are _____ fans in the Big House, you have to add about _____ more fans in order to increase crowd noise by 1 decibel.