Physics 102 Homework #4

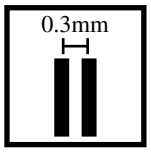
first draft due Wednesday, February 15th
final draft due Sunday, February 19th

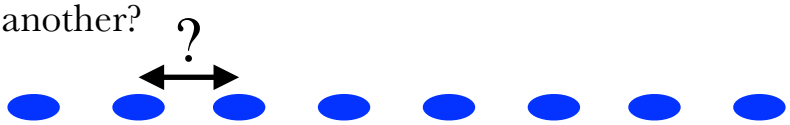
1a. If a machine makes a sound that has an intensity of $I = 6 \times 10^{-7} \mathrm{W/m^2}$ where you are (2 meters from the machine), how many decibels is it?

1b. If I add a second machine at the same place, how many decibels will I hear then?

1c. If I turn the second machine off, and step backwards until I am 4 meters away from the machine, how many decibels do I hear?

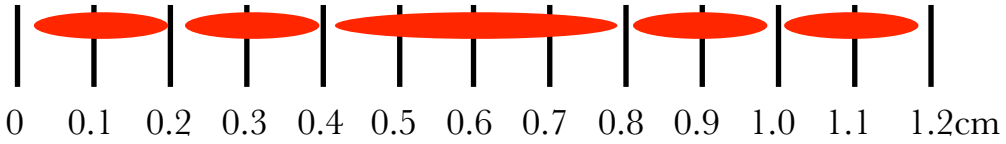
2a. Blue laser light (400nm) shines through two narrow vertical slits that are 0.3mm apart, onto a screen that is 5 meters away. How far apart are the dots from one another?





2b. If we add a few more slits as shown, how far apart would the dots be then?

3. Red laser light (633nm) shines through a single slit onto a screen that is 3 meters away, and creates the pattern shown. How wide is the slit, in millimeters?



4. A visible-light telescope (λ=500nm) can barely distinguish between a pair of binary stars which are 5×10^{-6} radians apart. What is the diameter of the telescope's opening?