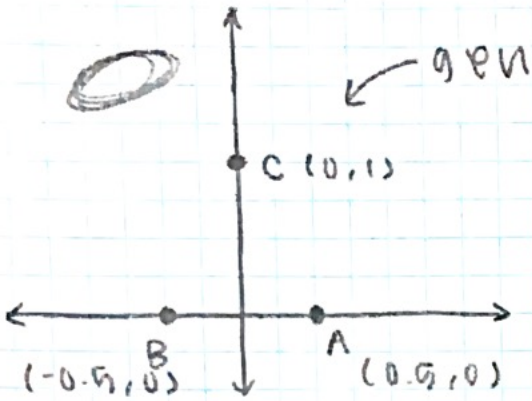
*STEP 4 - WORK

PARTH GUPTA



general graph

A. We know that the sound is coming from the northwestern part of quadrant 2.

B. Thinking about it logically, the signal reaches C first and B second. Therefore, it must be near the circle drawn on the graph.

C. Looking at the difference of arrival between C and B, we know the general graph will be a curve (exponential/hyperbola)

$$\sqrt{(y-1)^2+(x-0)^2} = \sqrt{(y-0)^2+(x+0.5)^2} - 0.39 \leftarrow \text{additional distance}$$

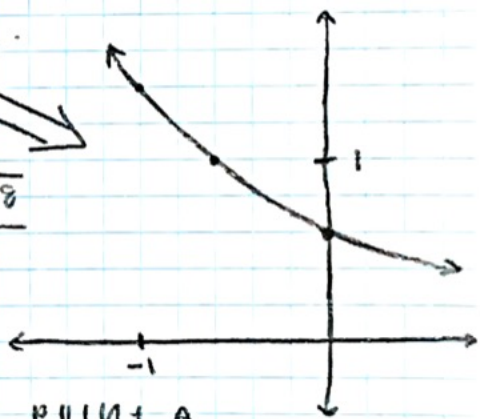
$$\sqrt{(y-1)^2+x^2} = \sqrt{y^2+(x+0.5)^2} - 0.39$$

found by: $(1481)(2.635 \times 10^{-4}) = 0.39$

When you solve for y, you get:

$$y = \frac{-4x+2.396+\sqrt{10.6874x^2+5.3437x+2.93348}}{6.7832}$$

When you graph this you get this.



D. Sort of like C, but you need to set up a system of equations:

$$\begin{cases} y = \dfrac{-4x+2.396+\sqrt{10.6874x^2+5.3437+2.93348}}{6.7832} \\ \sqrt{(x-1)^2+x^2} = \sqrt{y^2+(x-0.5)^2} - 1.04 \end{cases}$$

using point A

If you graph this, you find the intersection, which is $\boxed{(-3.5, 4)}$.

E. In order to do this with programming, I would first get the time as 3 doubles. Then I would find the minimum time (in this case, it was point C). Then, I would find the time difference between the minimum and the other two times. Then, for the rest, I would do something similar to the steps above.