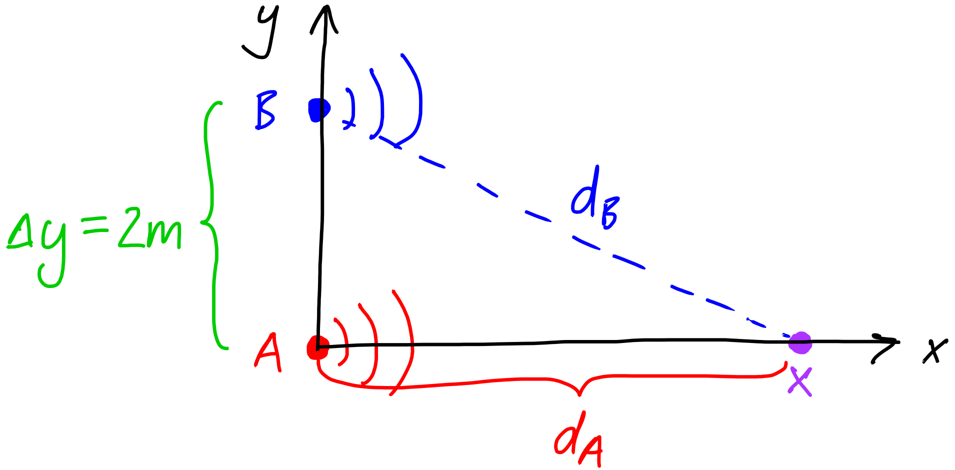
y
B
A
x
X
d_B
d_A
$\Delta y = 2m$

which implies

$$x = \frac{(\Delta y)^2}{n\lambda} - n\lambda. \tag{1}$$

Now we can plug in numerical quantities and $n = 0, \pm 1, \pm 2, \ldots$ into Eq. (1) to find

$$\begin{aligned}
x(n=1) &= \frac{(2\,\mathrm{m})^2}{0.43\,\mathrm{m}} - (0.43\,\mathrm{m}) = 8.87\,\mathrm{m}, \\
x(n=2) &= \frac{(2\,\mathrm{m})^2}{2(0.43\,\mathrm{m})} - 2(0.43\,\mathrm{m}) = 3.79\,\mathrm{m}, \\
x(n=3) &= \frac{(2\,\mathrm{m})^2}{3(0.43\,\mathrm{m})} - 3(0.43\,\mathrm{m}) = 1.81\,\mathrm{m}, \\
x(n=4) &= \frac{(2\,\mathrm{m})^2}{4(0.43\,\mathrm{m})} - 4(0.43\,\mathrm{m}) = 0.61\,\mathrm{m}.
\end{aligned}$$

Note that x is undefined for $n = 0$ and is negative for $n > 4$. Plugging in $n = -1, -2, -3, \ldots$ would also give us negative values. None of these makes sense since we are interested only in the positive x axis.

For destructive interference, we have to satisfy

$$\left(n + \frac{1}{2}\lambda\right) = \sqrt{x^2 + (\Delta y)^2} - x,$$

and solving for x in the same manner as before gives us

$$x = \frac{(\Delta y)^2}{(n + 1/2)\lambda} - \left(n + \frac{1}{2}\right)\lambda. \tag{2}$$

Plugging in numerical quantities and $n = 0, 1, 2, \ldots$ into Eq. (2),

$$\begin{aligned}
x(n=0) &= \frac{(2\,\mathrm{m})^2}{(1/2)(0.43\,\mathrm{m})} - \frac{1}{2}(0.43\,\mathrm{m}) = 18.4\,\mathrm{m}, \\
x(n=1) &= \frac{(2\,\mathrm{m})^2}{(3/2)(0.43\,\mathrm{m})} - \frac{3}{2}(0.43\,\mathrm{m}) = 5.56\,\mathrm{m}, \\
x(n=2) &= \frac{(2\,\mathrm{m})^2}{(5/2)(0.43\,\mathrm{m})} - \frac{5}{2}(0.43\,\mathrm{m}) = 2.65\,\mathrm{m}, \\
x(n=3) &= \frac{(2\,\mathrm{m})^2}{(7/2)(0.43\,\mathrm{m})} - \frac{7}{2}(0.43\,\mathrm{m}) = 1.15\,\mathrm{m}, \\
x(n=4) &= \frac{(2\,\mathrm{m})^2}{(9/2)(0.43\,\mathrm{m})} - \frac{9}{2}(0.43\,\mathrm{m}) = 0.13\,\mathrm{m}.
\end{aligned}$$

Again, $x < 0$ for $n < 0$ and $n > 4$, which are not sensible.

In order to find the frequency for which there is no destructive interference on the x axis, we should look at $n = 0$, since this gives us the point with the largest value of x. If we plug $n = 0$ into Eq. (2) and set $x = 0$, we are requiring that destructive interference can only occur at the origin. Solving for the wavelength λ tells us the smallest wavelength at which there is still destructive interference. We find

$$0 = \frac{(\Delta y)^2}{\lambda/2} - \frac{\lambda}{2} \quad\Longrightarrow\quad \frac{\lambda}{2} = \frac{(\Delta y)^2}{\lambda/2} \quad\Longrightarrow\quad \frac{\lambda^2}{4} = (\Delta y)^2 \quad\Longrightarrow\quad \lambda = 2\Delta y.$$

But if $\lambda > 2\Delta y$, then

$$\frac{(\Delta y)^2}{\lambda/2} < \frac{1}{2}\lambda,$$

and Eq. (2) tells us

$$x = \frac{(\Delta y)^2}{\lambda/2} - \frac{1}{2}\lambda < 0.$$

This means there is no destructive interference on the x axis. Thus, we need to satisfy

$$\lambda = \frac{v}{f} > 2\Delta y \quad \implies \quad f < \frac{v}{2\Delta y}.$$

Plugging in numbers, we find

$$f < \frac{344\,\mathrm{m\,s^{-1}}}{2(2\,\mathrm{m})} = 86\,\mathrm{Hz}.$$