TASK: Propagate the given boxcar pattern given distances 0.3m, 0.03m, 0.003m, 0.0003m, with wavelength 500nm
with the Fresnel and Fraunhofer single Fourier transform propagations so that they may be compared.
you should see the failure of nearfield variation appear when an imperfect boxcar shape forms in the near field Fresnel result. In comparison the Fraunhofer result is always shaped like the Fourier transform of the input amplitude, and does not approach a boxcar.
HINT: You are making 8 plots, you may write a function to make a plot and call it 8 times. A lineplot is reccomended

QUESTION: When the Fresnel propagation approaches a boxcar shape for short enough distances, what physical dimension
derived from the simulation best confirms it is the boxcar we started with?
HINT: You should be able to read it off from the initial condition plot, and propagation plot for short enough
propagation distance

QUESTION: For each of the four distances, state which approximations (of Fraunhofer and Fresnel) if any are valid
HINT: The width of the boxcar tells you the maximum unprimed coordinate radius **a** for nonzero amplitude in the transverse axes, which is used in the statement of each approximation, along with the length of z-propagation **L**
HINT: The Fraunhofer phase error is a^2/(L * lambda), so a^2/(L * lambda) << 1
The Fresnel phase error is (a^4)/(8 * L^3 * lambda), so (a^4)/(8 * L^3 * lambda) << 1

$$\text{Fresnel: } \frac{a^4}{8\lambda L^3} << 1$$

$$\text{Fraunhofer: } \frac{a^2}{\lambda L} << 1$$