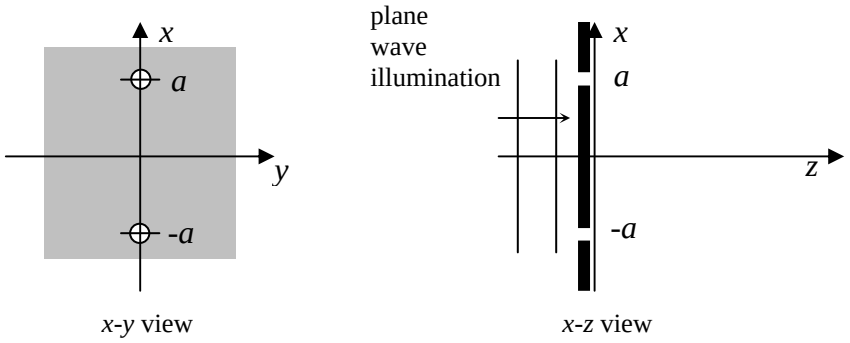
Do problems 4-7, 4-11, 4-15 from Goodman.

Complete the following problem (former midterm exam problem…)

Problem 1. An opaque screen has two pinholes, located at $x = a$ and $x = -a$. You may treat the screen transmission function $t(x,y)$ as given by $t(x,y) = \delta(x+a)\delta(y) + \delta(x-a)\delta(y)$. The screen is placed at the $z = 0$ plane and is illuminated by a z–directed unity amplitude plane wave.



x-y view $\qquad\qquad$ x-z view

a) Write the Fresnel integral relating the observed field $U(x_o,y_o,z)$ in the plane $z = z$, in terms of the field $U(x_1,y_1,0)$ in the $z = 0$ plane, and solve for $U(x_o,y_o,z)$.

b) What is the intensity $I(z) = |U(0,0,z)|^2$ **along the *z*-axis** (x=0 , y=0) behind the screen?

c) Now assume that a π phase delay element is placed in front of the pinhole located at $x = a$, so that $t(x,y) = \delta(x+a)\delta(y) - \delta(x-a)\delta(y)$. What is the intensity $I(z) = |U(0,0,z)|^2$ **along the *z*-axis** behind the screen?