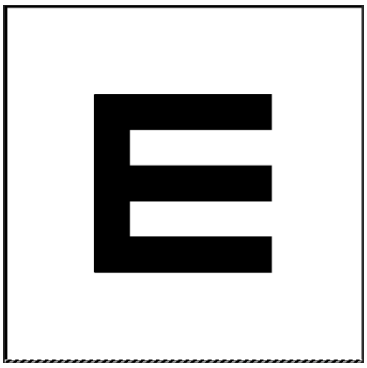
OPTI 512 Homework 2 Due: September 18, 2020

1. The letter E has a width and height of 25 mm, with each bar having a thickness of 5 mm. Suppose we want to make a 50 mm x 50 mm transmission mask where the white portions of the image represent a transmission of 1.0 (i.e. 100%) and the black portions of the image are opaque (transmission is 0.0). Using *rect*() functions, create a description of the mask transmission. There are multiple correct answers here. See if you can do it with just four *rect*() functions.



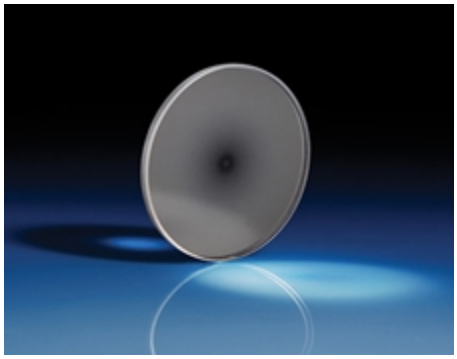
2. How does your answer to the previous question change if you want to create a complementary transmission mask where the background is opaque and the letter E is transparent?

3. Edmund Optics makes continuously variable Gaussian apodizing filters with specifications found at

   https://www.edmundoptics.com/f/continuously-variable-apodizing-filters/13777/

   Using our 2D special functions, create a description of the transmission profile of #64-385 filter. Note: The transmission T is related to the optical density (OD) by

   $T = 10^{-OD}$.



4. Do the following

   (a) Plot the following function

$$sin(x)\delta\left(x-\frac{\pi}{2}\right)$$

   (b) Evaluate the integral

$$\int_{-\infty}^{\infty} \sin(x)\,\delta\left(x-\frac{\pi}{2}\right)dx$$

   (c) Show the following relationship is true and plot the result.

$$cos(\pi x)comb(x) = \frac{1}{2}comb\left(\frac{x}{2}\right) - \frac{1}{2}comb\left(\frac{x-1}{2}\right)$$