MAS 450/854
Lab #3/4 pre-lab questions

Answer the following questions before you come to your lab section.

In lab number three, you'll make a holographic optical element using two point sources of light, both coming from the same beam. We'll make the first source using a laser beam diverged into a cone of light using a microscope objective. The location of this point source is just beyond the output lens of the objective, at the lens's focus.

The second point source is formed by passing part of the expanded beam through what the lab notes call a “split lens”: a lens that has been cut in half. This half-lens bends the light passing through it to a new focus some distance in front of the lens. This light, and the light from the first source, goes on to illuminate a holographic plate. This type of hologram is called "in-line" because the two point sources are lined up with the center axis of the hologram.

1. Using this information and the description from the lab notes (Lab #3, topic 1), do your best to sketch out the optical setup (as seen from above the holography table, looking down) that will be used to make the holographic optical element. Include the relative positions of the laser, the diverging microscope lens, the half-lens, and the holographic plate. Just sketch: you won't know the exact placement of the elements until you get to lab.

2. Similarly, sketch the illumination setup for the hologram as described on Lab #3, topic 5.

3. Remember to bring an object to class that you can use to make an in-line hologram for the second part of the lab (Lab #4). In a sentence or list, what makes a good object?

4. Lab #4, section 3, states: “If the object is too far from the plate, it may not have a real image. Can you explain why?” Use the holography demonstration program “inlinedemo” to find out. Place the reference point as far from the plate as possible, and place the illumination point at the same location. See what happens when you move the object point to different locations. Find a good ratio of object distance to reference/illumination distance to make the real images of the hologram visible and measurable.