9.3.4: Multiple Lenses

Once we have mastered systems with one lens, dealing with systems with more than one lens is not much more difficult. We start by looking at only the first lens. The first lens creates an image that we can find using the techniques we have already discussed. Light from the object appears to be coming from the image location, so we can replace the object and the first lens with a new object at the location of the image. We then ask how the next lens in our system affects the light from this new object.

It might be hard to visualize all of this at once, so let's look at an example of a two lens system. The image below presents one object (the arrow) and two converging lenses with the same optical axis. The dots along the optical axis indicate the position of the focal points of the lenses (filled circles for the left lens and hollow circles for the right one). We find the image from the first lens by doing a ray tracing:

The object and the first lens make it look to the second lens like the light rays are emanating from the image (the dashed arrow) on the left. To finish the problem we treat the image as an object in its own right:
Due to the combined effect of both lenses, an observer to the far right of this two lens system would see a small image like the dotted arrow above.