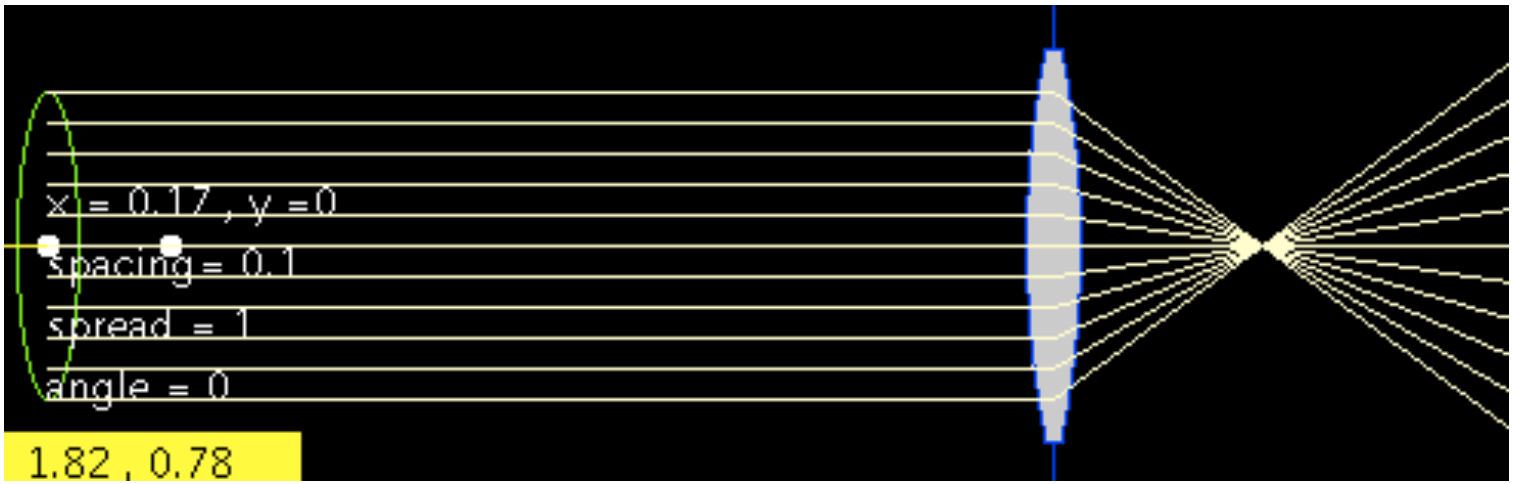
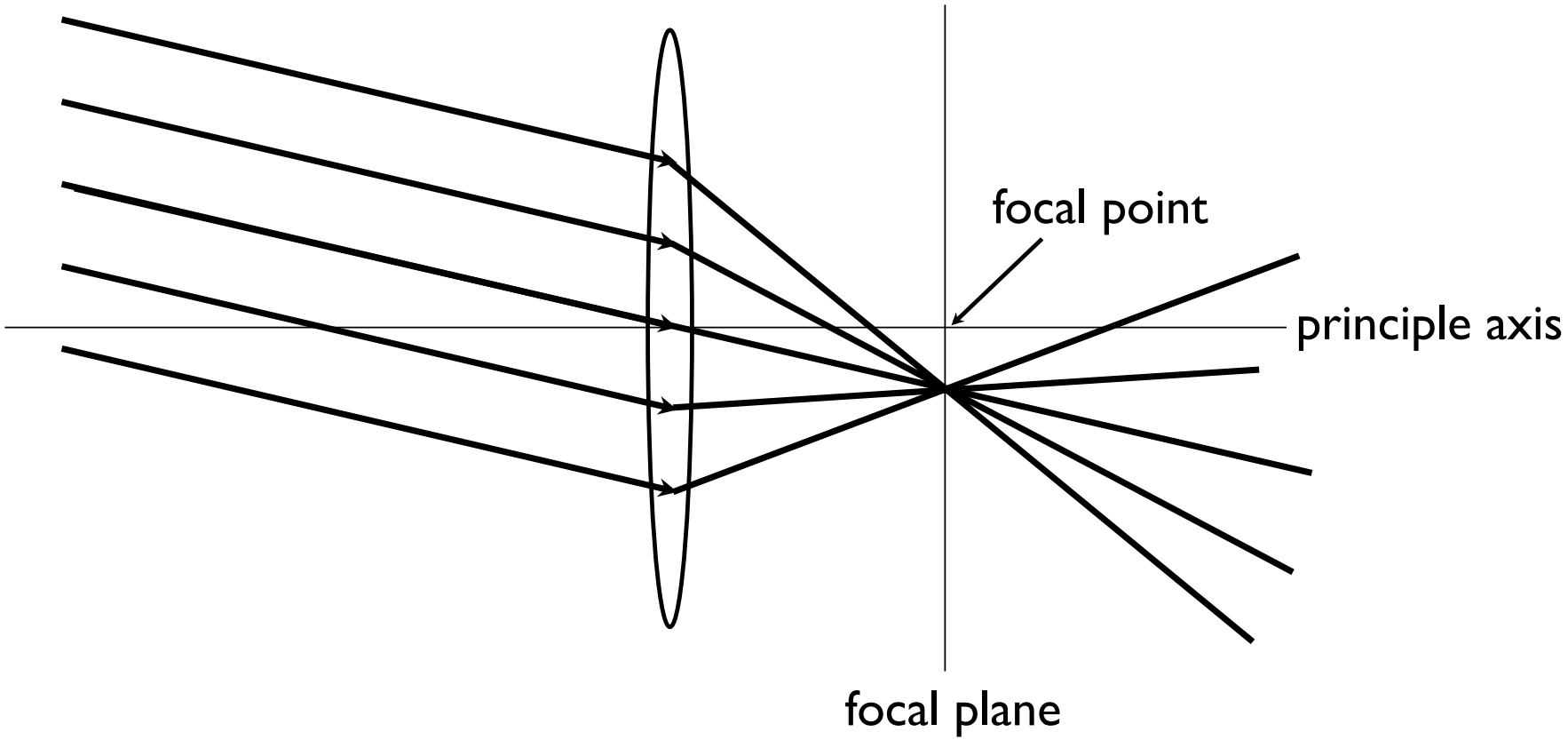
OPTICS QUESTIONS

1.) What happens when parallel ray's of light strike a CONVEX LENS?

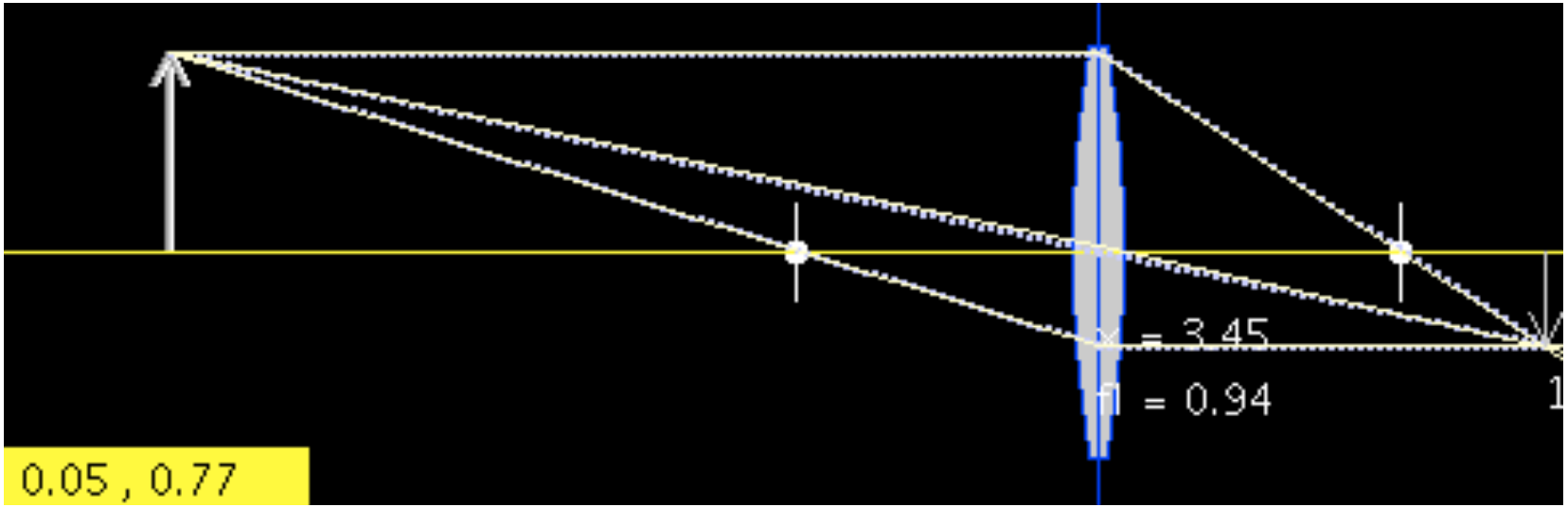


ANSWER: The rays *converge* on the lens's *focal point*.

Note: If the rays are parallel but not parallel to the *principle axis*, they will focus on the lens' s *focal plane*.

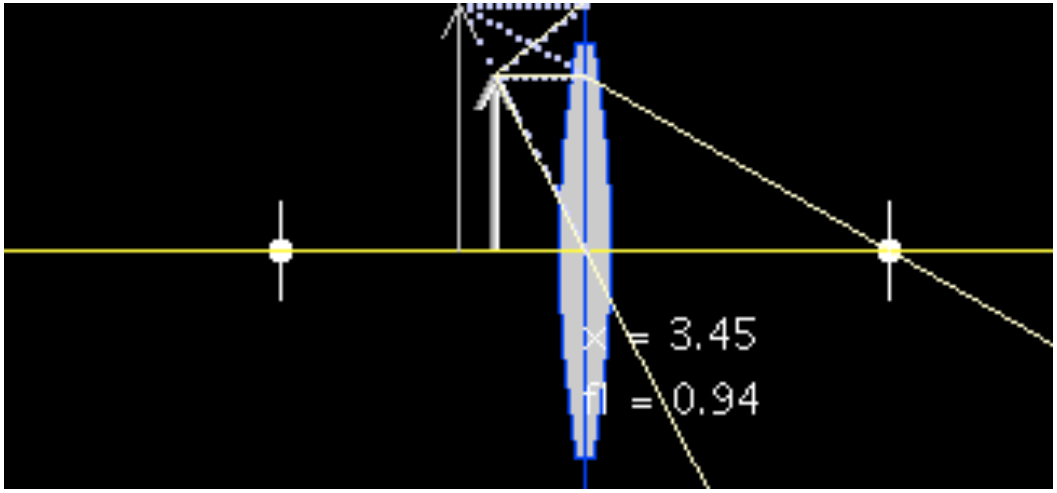


3.) You have an object located outside the focal point of a CONVEX LENS. What will rays passing through the lens do?



ANSWER: The rays will converge to form a real image that is inverted and outside the focal point on the opposite side of the lens.

4.) You have an object located inside the focal point of a CONVEX LENS. What will rays passing through the lens do?



ANSWER: The rays will diverge to form an virtual image that is upright and bigger than the object located inside the focal point on the same side of the lens as the object.

Note: This device is called a *magnifying glass*.

5.) What are the three rays that can be used when ray tracing any lens?

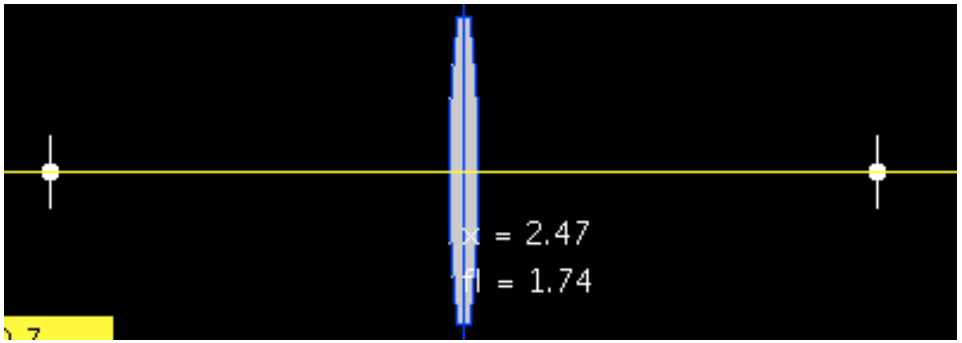
ANSWER:

a.) A ray coming in parallel to the principle axis will pass through the focal point on the opposite side of the lens.

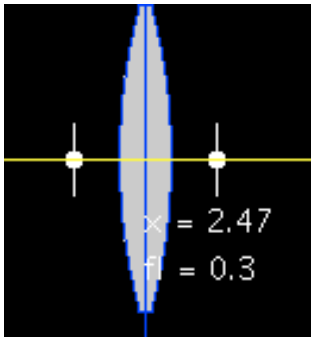
b.) A ray that strikes the center of the lens will pass straight through.

c.) A ray that passes through the focal point on the object's side of the lens will leave parallel to the principle axis.

6.) As a lens's thickness increases, what does its focal point do?



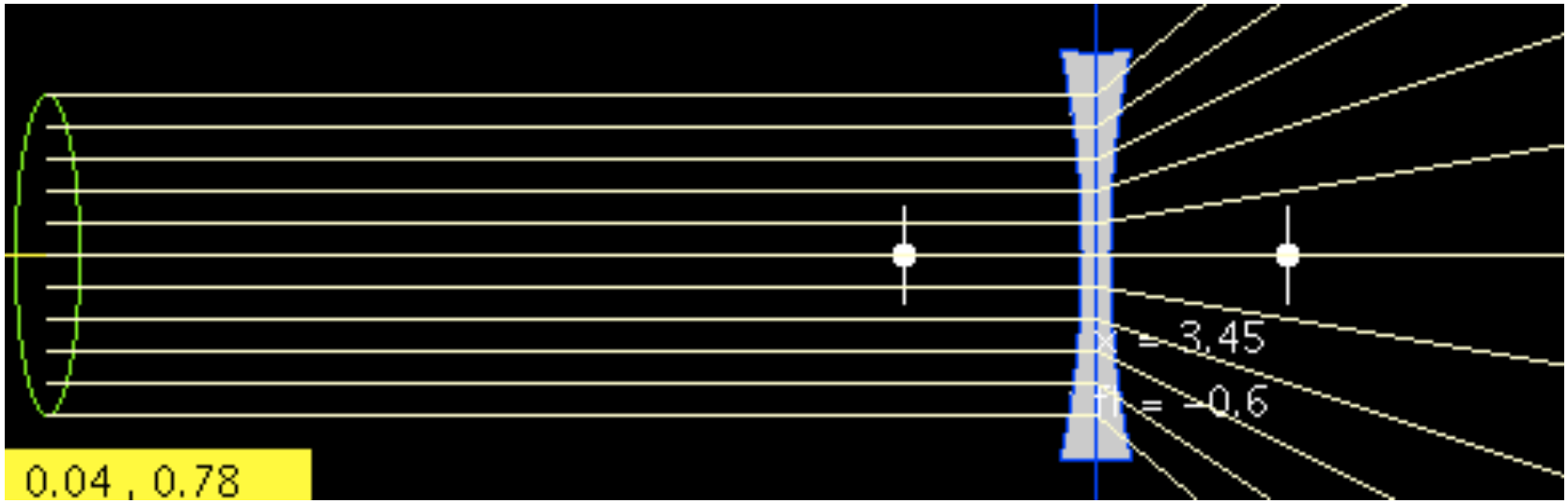
thin lens



thick lens

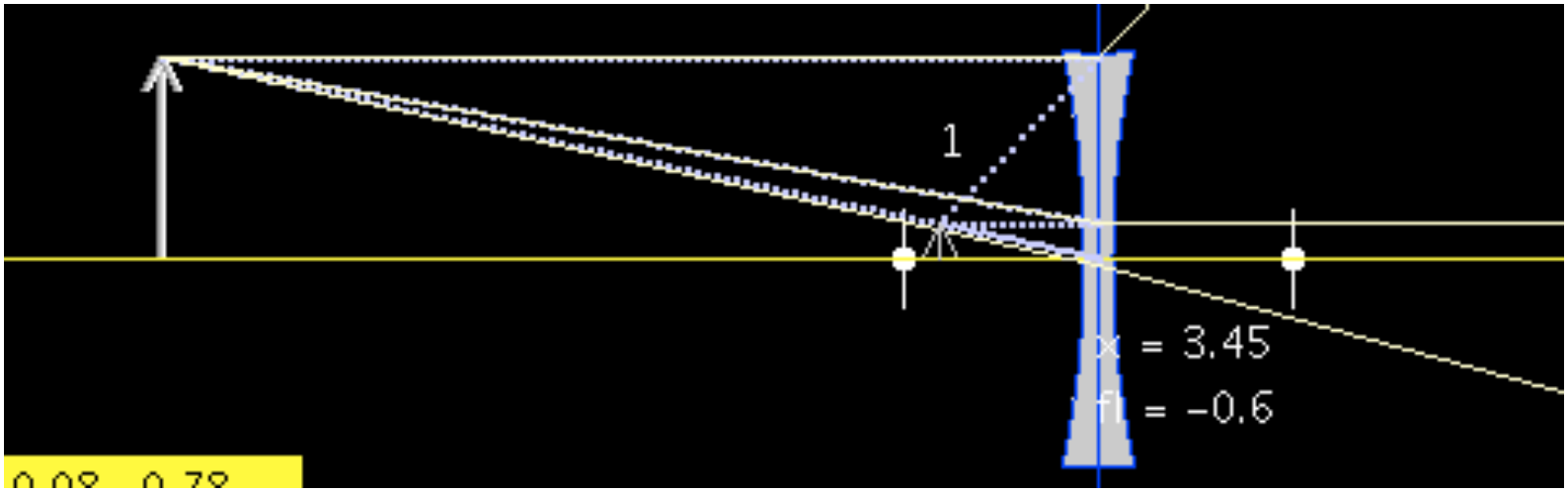
ANSWER: Evidently, as the lens gets thicker, its focal length diminished.

6.) What happens when parallel ray's of light strike a CONCAVE LENS?



ANSWER: The rays *diverge*. When observed from the opposite side of the lens, they appear to have originated from a point. That point is defined as the *focal point* of the concave lens.

7.) You have an object located outside the focal point of a CONCAVE LENS. What will rays passing through the lens do?



ANSWER: The rays will diverge to form a virtual image that is upright and inside the focal point on the same side of the lens.

8.) How do refracting telescopes work?

ANSWER (by the numbers):

a.) To gather as much light as possible from the observed object, we would like the first lens to be as large as possible.

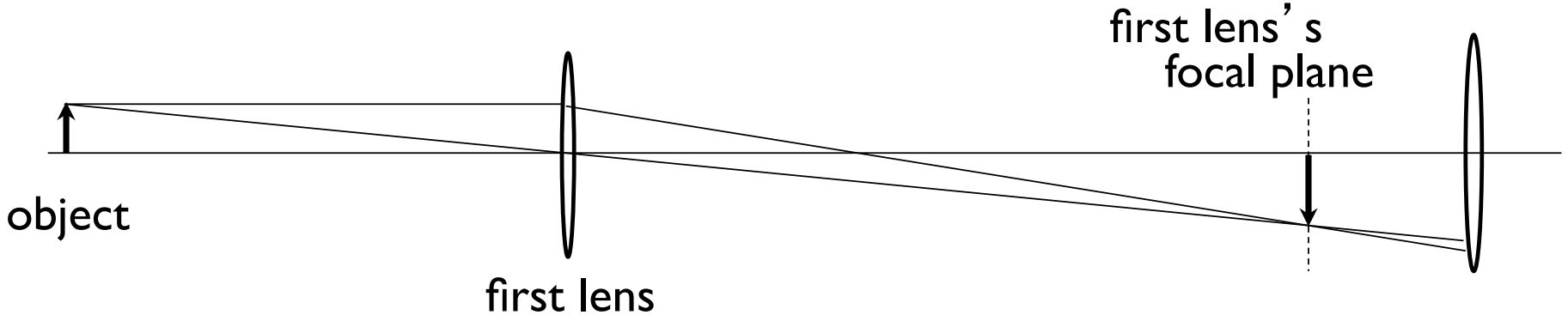
b.) Due to the fact that the cooling process required when making lenses can take upwards of years, large lenses need to be thin.

c.) Thin lenses have a long focal point.

d.) We assume that the light that comes in will be coming from an object that is far away.

e.) Light that comes in from a far object comes in parallel (light that isn't initially parallel to the rays that ultimately passes through the first lens will simply diverge before reaching the lens).

f.) Parallel light focuses on the first lens's focal plane.



d.) The image from the first lens becomes the object for the second lens.

e.) We would like the second lens to magnify what is being looked at, so we position it so that the first lens's image in INSIDE the focal length of the second lens. In that way, the second lens will act as a magnifier.

f.) This leaves us with the sketch on the next page.

expanded view