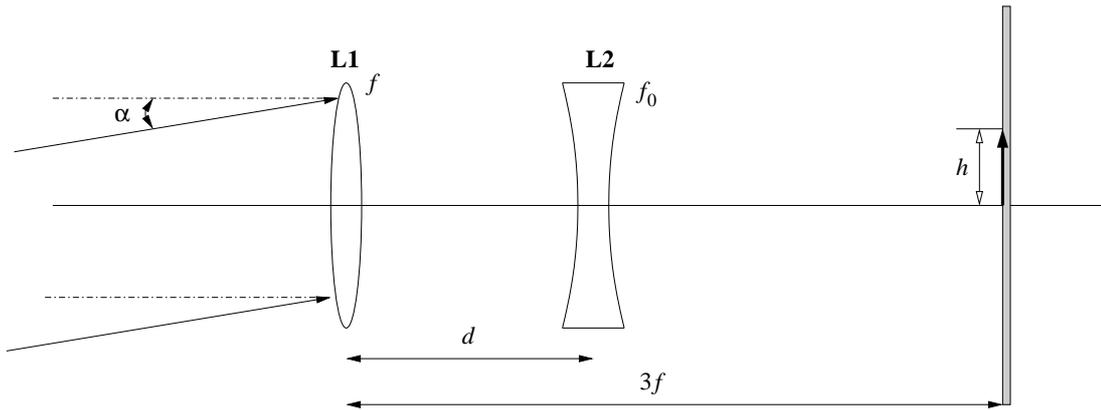


1. (40%) Specify if the following statements are true, false, or inappropriately stated. Give a brief justification of your opinion for each statement.
 - 1.a) A telescope must have large magnifying power.
 - 1.b) A microscope is the cascade of two magnifying lenses.
 - 1.c) Consider an optical instrument producing a virtual image. The human eye can convert the virtual image to a real image on the retina, independent of where the virtual image is located.
 - 1.d) A hyperopic person's unaided eye can focus on her retina objects that are far away (at infinity).
-

PLEASE TURN OVER!

2. (60%) Consider the telephoto lens system shown below. Lens L1 has known focal length f , and lens L2 has unknown focal length f_0 . The distance d between the two lenses is also unknown. Specify the telephoto system according to the following requirements:

- i) An object at infinity, placed off-axis at angular deviation $\alpha = 10^{-2}$ radians, produces a real image of size $h = 5 \times 10^{-2}f$ (cm).
- ii) The real image specified in part (i) is located at a distance $3f$ from L1.



- 2.a) Specify the two unknowns f_0 , d in terms of f .
- 2.b) Locate the principal planes.
- 2.c) What is the effective focal length (EFL)?
- 2.d) If a object is $24f$ away from lens L1, where is the image plane and what is the magnification? Is the image real or virtual, erect or inverted?

GOOD LUCK!

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2.71 / 2.710 Optics
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