

## Phys 362 Assignment 3

1. The Sun subtends an angle of  $0.5^\circ$  at the earth's surface, where the irradiance is  $\sim 1.0 \text{ kW/m}^2$  at normal incidence. What is the irradiance of an image of the Sun formed by a lens with a diameter of 5 cm and a focal length of 10 cm? (/5)
  
2. Light rays enter (from the left) the planar surface of a plano-convex lens ( $n = 1.5$ ), with the convex side having a radius of 3 cm. The medium is air.
  - a. Use the system matrix to determine the exit elevation and angle of a ray that entered parallel to the O.A. at a height of 1 cm above the axis. /5
  
  - b. Using this new system matrix, solve for  $x$  where the ray described in part (a) intersects the optic axis. /5
  
3. The diagram below shows a modified Cooke triplet camera lens. It consists of six consecutive interfaces corresponding to the three lenses. We'll number them 1 to 6 going from left to right. The thicknesses and refractive indices of the three lenses will be subscripted 1 to 3, and there are two separation distances,  $d$ , also in order left to right. Accordingly, with all numbers in mm:
 

|              |            |              |             |
|--------------|------------|--------------|-------------|
| $r_1=19.4$   | $t_1=4.29$ | $n_1=1.6110$ | $d_1=1.63$  |
| $r_2=-128.3$ | $t_2=0.93$ | $n_2=1.5744$ | $d_2=12.90$ |
| $r_3=-57.8$  | $t_3=3.93$ | $n_3=1.6110$ |             |
| $r_4=18.9$   |            |              |             |
| $r_5=211.3$  |            |              |             |
| $r_6=-66.4$  |            |              |             |

How far behind the last lens surface does the sensor have to be if we would like to focus a distant object? (/10)

