

## PH481 Homework 7

Due: Friday, 3<sup>rd</sup> of March 2023

**10.22\*** Starting with the irradiance expression for a finite slit, shrink the slit down to a minuscule area element and show that it emits equally in all directions.

**10.40\*** Suppose that we have a laser emitting a diffraction-limited beam ( $\lambda_0 = 632.84 \text{ nm}$ ) with a 2.0-mm diameter. How big a light spot can be produced on the surface of the Moon a distance of  $376 \times 10^3 \text{ km}$  away from such a device? Neglect any effects of the Earth's atmosphere.

**10.46\*** The Mount Palomar telescope has an objective mirror with a 508-cm diameter. Determine its angular limit of resolution at a wavelength of 550 nm, in radians, degrees, and seconds of arc. How far apart must two objects be on the surface of the Moon if they are to be resolvable by the Palomar telescope? The Earth-Moon distance is  $3.844 \times 10^8 \text{ m}$ ; take  $\lambda_0 = 550 \text{ nm}$ . How far apart must two objects be on the Moon if they are to be distinguished by the eye? Assume a pupil diameter of 4.00 mm.