HW2 PHYS168 lasers Spring 2012 Prepared by N. Eradat
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- Problems from Verdeyene
- 7.12, 7.13,
- 1.1, 1.2, 1.3

1) Intensity on the retina of the sun light and of the He-Ne laser beam

At the surface of the earth the intensity of the sun is approximately 1 kW m^{-2}. Calculate the intensity at the retina that results when looking directly at the sun. Assume that: (i) the pupil of a bright-adapted eye is 2 mm in diameter; (ii) the focal length of the eye is 22.5 mm; (iii) the Sun **subtends** an angle of 0.5°. Compare this intensity with that resulting when looking into a 1-mW He-Ne laser (λ=632.8 nm) with a 2-mm diameter [the diameter of the beam in the focus of a lens of focal length **f** can be calculated as $D_F = 4 f \lambda / (\pi D_0)$, where D_0 is the beam diameter on the lens and λ is the laser wavelength].

2) Doppler broadening

Calculate the Doppler broadened line width for the **488-nm** transition of an argon ion laser, given that the temperature of the discharge is **6000** K and the atomic mass of argon is **39.95.** Repeat the previous calculation for the 632.8-nm line of a He-Ne laser, where the temperature of the discharge is about **400** K. The atomic mass of neon is **20.18.**