Name:

Physics 51
Homework #20
November 21, 2016

41-P7*, 44-P3, 44-P4, 44-E3

41-P7* A plane wave of monochromatic light falls normally on a uniformly thin film of oil that covers a glass plate. The wavelength of the source can be carried continuously. Complete destructive interference of the reflected light is observed for wavelengths of 485 and 679 nm and for no wavelengths between them. If the index of refraction of the oil is 1.32 and that of the glass is 1.50, find the thickness of the oil film.

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44-P3 A stack of polarizing sheets is arranged so that the angle between two any adjacent sheets is α. The sheets are arranged so that N sheets rotate the plane of polarization by θ, where $\theta = N\alpha$. Calculate the fraction of light that will pass through the stack in the limit as $N \to \infty$. Assume that θ is fixed, so $\alpha \to 0$.

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44-P4 It is desired to rotate the plane of vibration of a beam of polarized light by 90°.

(a) How might this be done using only polarizing sheets?

(b) How many sheets are required for the total intensity loss to be less than 5.0%?

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44-E3 A beam of unpolarized light of intensity $12.2\,\mathrm{mW/m^2}$ falls at normal incidence on a polarizing sheet.

(a) Find the maximum value of the electric field of the transmitted beam.

(b) Calculate the radiation pressure exerted on the polarizing sheet.

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