

**Phys 375 HW 2**  
**Fall 2006**  
**Due 18 / 20 September, 2006**

1. Pedrotti<sup>3</sup>, 3<sup>rd</sup> edition, problem 2-7 (see Fig. 2-33).
2. Pedrotti<sup>3</sup>, 3<sup>rd</sup> edition, problem 3-6.
3. Write an expression for the  $\vec{E}$  - and  $\vec{B}$  -fields that constitute a plane harmonic wave traveling in the  $+z$ -direction. The wave is linearly polarized with its plane of vibration at  $45^\circ$  to the  $yz$ -plane.
4. Prove that to someone looking straight down into a swimming pool, any object in the water will appear to be  $\frac{3}{4}$  of its true depth.
5. Light is incident in air perpendicularly on a sheet of crown glass having an index of refraction of 1.552. Determine both the reflectance and the transmittance.
6. Show analytically that a beam entering a planar transparent plate, as in the figure, emerges parallel to its initial direction. Consider the case where the plate has a side length  $t$ , and the laser beam has an angle of incidence  $\alpha$ , and angle of refraction at the first interface of  $\beta$ . Find an expression for the lateral displacement of the exiting beam relative to the incident beam,  $s$ , in terms of  $t$  and trigonometric functions of  $\alpha$  and  $\beta$ . Use Snell's law and some geometrical thinking.

