

## PHY431, Homework 5 DUE: Feb 23 2017

### Superposition, Interference, Polarization

1. (4 pts) Two waves are given by

$$E_1 = \frac{5E_0}{(3x-4t)^2+2} \quad (1)$$

and

$$E_2 = \frac{-5E_0}{(3x+4t-6)^2+2}, \quad (2)$$

with  $x$  in meters and  $t$  in seconds.

- Describe the motion of the two waves
  - At what instant is their superposition everywhere zero?
  - At what point is their superposition always zero?
2. (3 pts) The ratio of the amplitudes of two beams forming an interference fringe pattern is 2/1. What is the fringe contrast? What ratio of amplitudes produces a fringe contrast of 0.5?
3. (3 pts) An unpolarized beam of light is incident on a pair of polarizers  $A$  and  $B$ . Rank the intensity of the transmitted light for the following three cases:
- The axis of polarization of  $A$  is vertical and the axis of polarization of  $B$  is at  $45^\circ$  with respect to the vertical.
  - The axis of polarization of  $A$  is vertical and the axis of polarization of  $B$  is at  $60^\circ$  with respect to the vertical.
  - The axis of polarization of  $A$  is horizontal and the axis of polarization of  $B$  is at  $45^\circ$  with respect to the vertical.

Now assume that the incident beam is linearly polarized in the vertical direction. What would be the ranking of the intensities in the three cases?