

ASTRONOMY 300B: Exam Number 2

Prof. Jill Bechtold

Spring 2009

The second exam will be in class on Friday, March 27. The exam will cover

- Sections 2.3, 2.4 and 2.5; Chapter 3 and Section 4.1 of Rybicki & Lightman.
- The class notes:
 - The Radiation Spectrum
 - Polarization
 - Electromagnetic Potentials
 - Thomson Scattering
 - Radiation Reaction
 - Special Relativity, Parts 1 and 2
- Homework assignments 5-7.

The format is that you are allowed to bring 2 page of notes into the exam – presumably the one you brought to the first exam, and a new one. Although I am not testing you on the material covered in Exam 1, I may use some of the ideas, e.g. optical depth, or the Planck function. I will give you a copy of physical constants and any trigonometric identities you may need.

Please bring a calculator.

Examples follow.

1. What is a quarter wave plate?

2. A plane wave solution to the wave equation is

$$\mathbf{E} = \mathbf{y} E_y \cos(\omega t - kx + \alpha) + \mathbf{z} E_z \cos(\omega t - kx + \beta)$$

where \mathbf{y} and \mathbf{z} are unit vectors in the y and z direction, respectively, and E_y and E_z are real amplitudes. Under what conditions is this wave linearly polarized, ie what relations must E_y , E_z , α and β satisfy?

3. Fourier Transforms. Consider the function

$$F(x) = \delta(x-x_1) + \delta(x+x_1)$$

where δ is the Dirac delta function and x_1 is a positive, real constant.

Sketch what this function looks like, derive the Fourier transform of it, and sketch its Fourier transform.