

Homework no. 4

**Modern Techniques in Biophysics**

Topic: Magnetic Resonance Imaging

Due date: February 20, 2015

**Problem 1: MRI Gradient coils**

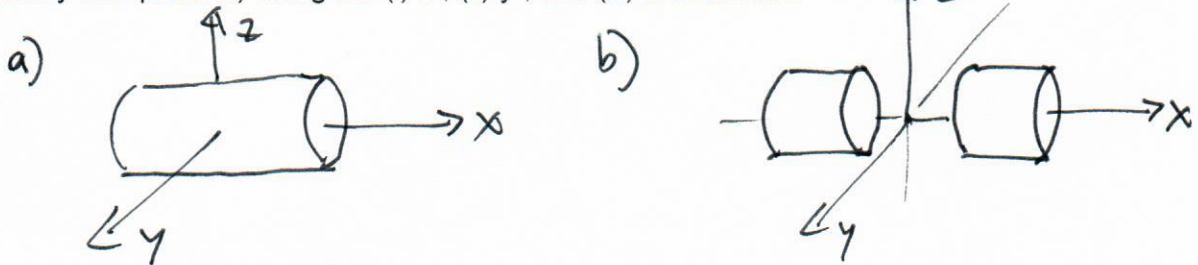
What are MRI gradient coils? How do they create distortions in the applied magnetic field? Explain explicitly. Draw a simple diagram of the gradient coils in a typical horizontal MRI scanner.

**Problem 2: Spatial Encoding**

Explain explicitly on how spatial information is encoded in MRI signal. For simplicity, use an example of a linear magnetic field gradient in 1D for an object under a uniform magnetic field  $B_0$ .

**Problem 3: 1D MR imaging**

Draw the expected 1D proton MRI profile for the following shaped-objects (assuming these are filled uniformly with protons) along the (i) x-, (ii) y-, and (iii) z-directions.



**Problem 4: 2D Gradient echo imaging**

Draw the expected MRI images of the following object along the following planes of imaging:

- (a) Axial
- (b) Coronal
- (c) Sagittal

