BENG280A, Principles of Biomedical Imaging 10/28/10
Fall Quarter 2010

HOMEWORK #5
Due in Class on Thursday 11/04/10

Readings:
View the MRI safety video on the website.
Read Nishimura chapters 1 through 5 (Focus on chapters 3-5).
Recommended: Also read Chapter 12 in Prince and Links and supplementary notes by L. Hanson (up to about page 32).

Problems: (In Nishimura unless otherwise stated)

1. From the safety video, answer the following questions: (a) What are helium and nitrogen used for in the MRI system? (b) What does the term quench mean? (c) Why is it dangerous to smoke near an MRI system? Find a example (on the web) of a large object that's been pulled into the magnet and include a copy of the image.

2. Problem 4.3 (in other words, show that Eqn 4.15 is a solution to Eqn 4.14) ; In addition, use MATLAB to plot out the solution for initial conditions of (a) $M_z(0) = 0$; (b) $M_z(0) = -M_0/2$; and (c) $M_z(0) = -M_0$. Assume a T_1 of 1 second. For each of the initial conditions, determine the time at which the magnetization recovers to $0.95M_0$. Is this time the same for all initial conditions – explain your finding.

3. Problem 4.4.

4. Problem 12.1 in Prince and Links. For the time that you calculate for this problem, what will the phases be at z = 0.25 cm, 0.5 cm and 0.75 cm?