HST.583 Functional Magnetic Resonance Imaging: Data Acquisition and Analysis Fall 2008

For information about citing these materials or our Terms of Use, visit: http://ocw.mit.edu/terms.

HST.583: Functional Magnetic Resonance Imaging: Data Acquisition and Analysis, Fall 2008 Harvard-MIT Division of Health Sciences and Technology Course Director: Dr. Randy Gollub.

2.

 $d(\Delta n)/dt = -(\Delta n - \Delta n_0) / T1$ 

 $d(\Delta n) / (\Delta n - \Delta n_0) = -dt/T1$ 

Then integrate both sides.

Note or recall that the integral of dx/x is the natural log of x, or ln(x).

Also recall that  $e^{\ln(x)} = x$ .

Finally, note that  $\Delta n_0$  is the population level difference after the sample has been placed in the magnet for a long period of time, and  $\Delta n(0)$  is the population level difference just after the sample has been placed in the magnet. Think about what these values are.

For part b),  $\Delta n_0$  is the boltzman distribution, so we want to know when  $\Delta n(t)$  equals 90% of  $\Delta n_0$ .

3.

Assume a rectangular phase gradient pulse of duration 10ms.

Note from the lecture notes that for a rectangular gradient pulse

 $\theta(\mathbf{y}) = \gamma B_0 \Delta \mathbf{y} \mathbf{G}_{\mathbf{y}} \tau,$ 

where  $\tau$  is the pulse duration,  $\gamma$  is the Larmor frequency, ~ and we assume  $\Delta y$  is 1 cm and  $B_0$  is 1 Tesla.

Also note that  $FOV_y = 1 / (\gamma G_y \tau)$