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

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 Δn_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), Δn_0 is the boltzman distribution, so we want to know when $\Delta n(t)$ equals 90% of Δn_0.

3.

Assume a rectangular phase gradient pulse of duration 10ms.

Note from the lecture notes that for a rectangular gradient pulse

$\theta(y) = \gamma B_0 \Delta y G_y \tau$,

where τ is the pulse duration, γ is the Larmor frequency, and we assume Δy is 1 cm and B_0 is 1 Tesla.

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